CHEMICAL LIBRARY MAY 21 1917

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXXXVIII. No. 2815.] LONDON, APRIL 24, 1917. [69th Year. Price 6d.

O'NEILL'S
OXIDE
GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
SULPHATE OF AMMONIA PLANT
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
W. NEILL & SON, Ld.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'Neill, St. Helens.' Telephone No. 20.

PURIFYING MATERIAL
"Brownox-de-Luxe."
Unqualified Satisfaction given where used.
SPENT OXIDE PURCHASED
J. BROWN & CO., Ltd.
Savile Town, DEWSBURY.

TORBAY
STOVE BLACK
FOR GAS COOKERS.
The TORBAY PAINT CO.,
26, 27, & 28, Billiter St., London, E.C.
39-41, Old Hall St., Liverpool.

"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Makers of
GASHOLDERS,
TANKS (C.I. or Steel),
PURIFIERS,
WASHERS,
ROOFS,
&c.
ASHMORE, BENSON, PEASE & CO., Ltd.,
STOCKTON-ON-TEES.
Complete GAS WORKS
London Office:
80, Victoria Street, Westminster, S.W.
Telegrams: "GASHOLDER."

W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on page III. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

ESTABLISHED — 1861 —
Telegrams: "DRY METERS, LONDON."
Telephone: KENSINGTON, 1140.

George Glover and Co., Ltd.
RANELAGH WORKS
Royal Avenue, Chelsea
LONDON, S.W., 3.

Highest Awards at the Principal International Exhibitions.
Branches at LEEDS (9, Dewsbury Road) and MANCHESTER (Gaythorn Meter Works, Easton St.).

SPECIALISTS IN DRY GAS METERS—SLOT, KEY, AND ORDINARY.
Every meter leaving George Glover and Co.'s works, irrespective of size—and they build up to 3000 Lights—is regulated and tested for soundness at 12 in. pressure, and for registration not only at the ½ in. pressure prescribed by the "Sales of Gas Act," but at 3 in. pressure with full outlet capacity, so as to prevent "slow" registration even when the meter is overworked.
AGENTS FOR THE PATENT M. & M. SELF-LOCKING SLOT METER PADLOCK.

RITCHIE C.I. PIPES FOR GAS & WATER. MIDDLESBROUGH.

T. & J. DEMPSTER, LTD., 24 & 2326 Manchester. & COAL WASHER. NOTTINGHAM SOLE MAKERS OF THE

HIGH PRESSURE GAS PLANTS

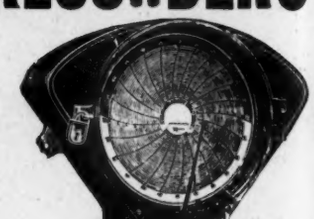
BOOSTING FANS, ROTARY & RECIPROCATING COMPRESSORS,
DISTRICT & SERVICE GOVERNORS.

GEO. WALLER & SON, Phœnix Iron-Works, **STROUD, GLOS.**

SIMMANCE'S

INCORRODIBLE DEAD BEAT RECORDERS

Are BRITISH MADE and Accurate.



Comparison with other Recorders is invited.

Hundreds of ranges for any vacuum or pressure
(Foul or Pure Gas, Air, Steam, Water, or Oil).

Sole Makers: **ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.**

AGENTS: Australia—FYVIE & STEWART, 360, Collins Street, Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

DONKIN

for

DISTRICT SERVICE GOVERNORS

HIGH AND LOW PRESSURE SERVICE REGULATORS, METER REGULATORS,
STOVE AND LAMP REGULATORS, SERVICE CLAMPS AND FITTINGS.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, **CHESTERFIELD.**

LONDON OFFICE: MILLBANK HOUSE, Wood Street, WESTMINSTER, S.W.

Chesterfield Telephone No. 84.
London Telephone No. 5338 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

GAS JOURNAL

LIGHT · HEAT · POWER · BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXXXVIII., No. 2815.] TUESDAY, APRIL 24, 1917. [69TH YEAR.

EDITORIAL NOTES.

The Chairman of the Board of Fuel Research and Fuel Gas.

IT was a delightful afternoon that Mr. H. M. Thornton gave to the large audience that assembled last Wednesday in the theatre of the Royal Society of Arts, when he read a paper, richly illustrated by photographs, on "The "Application of Gas to Industry in War Time: Its National "Importance." If the lecture was interesting to those present who were not of the gas industry, it must have been intensely so and pleasing to those who are of the industry; for it added another to those recent demonstrations of the substantial and healthy progress that is being made in the domain of gas heating in industry—not only for metallurgical work and power, but for factory canteens and such-like purposes. But, while the paper was the feature of the occasion, by those who are watching closely the channel that the stream of events is taking in the gas industry, the palpitations were then and there felt of influences that are at work, and which the industry (even if it would) cannot resist. Prefacing them, it can truly be said that the industry has done well in promoting fuel and national economy in ways well known to our readers. But let us underline these ways for the benefit of those who are not constant readers, but whose eyes this article may reach. In carbonizing the coal it uses, it produces so many cubic feet of gas, about (for sale) half a ton of coke, and other secondary products highly valuable and indispensable to various industries and to agriculture. It adds further to national economy by supplying fuels which are not smoke-producing, which promote health and avoid the destructive influences concomitant to the combustion of coal, and which save labour—in industry and the domestic household. It has proved its virtues and advantages in very material manner, so much so that lecturers and professors have been persuaded, and bave urged, that the Government should take drastic steps, and put an end by legislation once and for all to the waste that proceeds by the burning of coal for the one operation of producing heat. There are some classes of coal that are not fit for anything else; but there is a tremendous tonnage that is annually being consumed that is, and the world is being robbed right and left through the misuse.

In his paper Mr. Thornton indicated that he had—perhaps mildly—fallen under the spell of the altruist lecturers and professors who dream of the conditions being ripe for the legislative annulment of coal waste. "What an impetus," he said, "it [that is the value that is extracted from coal "by carbonization in closed vessels] provides for legislation "to reduce the amount of coal burnt in a raw state." We are not at all sorry that Mr. Thornton expressed himself thus, because it drew from the Chairman of the evening, Sir George T. Beilby, LLD., F.R.S., a pronouncement of personal view that is significant and important. Its importance arises from the fact that Sir George is the Chairman of the Board of Fuel Research; and the work of the Board is going to have large influence upon the future. It was not as Chairman of the Board that Sir George spoke; but we cannot shut our eyes to the fact that the Chairman of such a body in its deliberations and conclusions is a person of consequence. In the matter of fuel reform (which means coal economy), it will be seen that he is distinctly against any heroic or drastic legislative measures; and if the Board of Fuel Research sets itself against compulsion in eliminating from our daily processes—domestic and industrial—the use of raw coal, we may be sure the Government will accept its advice. Of course, the Board, as such, has not yet done anything of the kind; but the view is that of its gifted Chairman, and this view must have weight. And we are with him—up to a point. It is obvious, too, that Sir George believes in fuel reform taking the course of natural evolution. This is seen when he tells us that the lesson he draws from the paper is that "reform can only be brought abo ut by "such work as Mr. Thornton and his manufacturing col- "leagues are doing," and, we might interpolate, "the gas "industry." And, again, "if we could only get a large "number of men working like Mr. Thornton, the grand "reform would go on much more quickly than we could "otherwise hope for." It is remarkable what has been accomplished in the domain of industrial gas heating, particularly during the war. The figures incorporated in the paper as to the marvellous increases in gas output for industrial purposes by certain undertakings, and the statement of Sir Robert Hadfield that his firm in Sheffield alone use 500 million cubic feet of town gas a year, are eloquent of the progress of the reform. Legislation, compelling and penalizing for infractions of the statutory mandates, may be successful; but Sir George Beilby believes in the more sober courses to reform provided by improvements which constitute fresh gains in economy and efficiency. Such factors cannot be permanently resisted; they are certain to achieve their destined purpose; nothing can keep them back. It may, however, be suggested that legislation need not go to the lengths advocated by extremists, but might be framed so as to co-operate with the advances made in appliances and fuel, and help in future to keep within limits defined by the past the traditional practices of architects, builders, and manufacturers, which practices are serious obstacles in the way of fuel reform and economy. We repeat that the Board of Fuel Research is an influence affecting the future of this subject, and so is its Chairman.

Sir George and Mr. Thornton both spoke of the rapid rate of progress in improvement in gas-consuming apparatus, and the latter is optimistic as to the rate being maintained. If fortunately the belief is well founded, the rate of progress in adoption will be favourably affected. No one a few years ago could have anticipated such development as there has been the last few years in the use of gas as fuel. But the necessity of industry has largely been the incentive; and things would have gone along at a much slower pace had it not been for the necessity. But we would suggest to Sir George Beilby that what has been done shows what can be done; and consideration of this obvious fact will perhaps make him think less hardly of those lecturers and professors who airily talk of infinite advantages and untold wealth and prosperity by fuel reform hastened by legislative action. What has been accomplished gives the gas industry a legitimate right to look ahead for something still greater. But the gas supply industry will have to make its contribution to facilitate progress. Here we have another influence that was felt at the meeting of the Society of Arts last week. The manufacturers are speaking; and they will speak still louder. They are asking for cheaper gas, and not necessarily gas of the quality at present supplied. They desire as many B.Th.U. and as little inert constituents as possible for the money they expend. To them the volume of the gas containing the B.Th.U. does not much matter. But it is not producer gas, with its large proportion of nitrogen, that they require. What they do want is indicated by the Chairman of the Board of Fuel Research; and this is again significant. "I feel," he said, that while gas consumption will "go on and still largely increase, it will be necessary that "we should have a larger production of cheap and, if neces- "sary, poorer fuel gas."

Sir George Beilby is far from being a visionary. In him

science and practice are intermingled in their right proportions. And these words of his are an expression of a want a contribution to the meeting of which has recently been the subject of articles and correspondence in our pages directed to the question of adulteration of coal gas by incombustibles or dilution by combustibles—the latter with a view to getting more B.Th.U. delivered in the gaseous way from every ton of coal carbonized, by gasifying a proportion of coke. The manufacturers want gas at a cheaper rate. Sir Robert Hadfield spoke to this; Mr. James Swinburne emphasized it. But it is no use throwing up into the faces of the gas manufacturers of this country the great endowment by natural gas of some areas in America, where gas of high calorific value can be obtained for a few cents per 1000 c.ft. We have no natural gas here for distribution in the same way; it is America's good fortune that she has. But Sir Robert urges that this advantage of American manufacturers in natural gas will place British manufacturers at a disadvantage in the coming competition; therefore the greater need for British gas undertakings to bestir themselves. We should like to point out to him that natural gas is not universally supplied in America, while American manufacturers are ubiquitous in the States, and therefore large numbers have perforce, if they need to employ gas, to use coal gas, which in America is very considerably dearer than it normally is in England. And fuel is not the only charge which makes differences weighing in the industrial competition between America and this country.

However, the manufacturers are moving for cheaper gas; and gas manufacturers should seriously set themselves to work to see what they can do. Remember that Sir George Beilby is Chairman of the Board of Fuel Research; and we have him on our side in the production of "a cheaper, and, "if necessary, poorer fuel gas." Generally speaking, the gas industry cannot afford a dual supply, but, given the assistance of the Legislature, the industry has by no means reached the limits of its capabilities in production. The war has been busy removing the scales from the eyes of those technically interested in the manufacture of gas; and to-day they see many things in an altogether new light. Gas undertakings have to the best of their power to meet the requirements of industry, and not lose the business for the want of effort.

An Investigation into Economical Gas Making.

Just before going to press, an important letter comes to hand from Mr. Charles Hunt; and it is published in our "Correspondence" columns. He refers to our article in last week's issue under the heading of "The Plant and the "Standard," and to the succeeding one, "Wanted, a Special "Committee." He thinks it probable that the comparative paucity of applications for the calorific power standard, under the Gas (Standard of Calorific Power) Act, may be due to the opinion that 500 B.Th.U. is not the "last word" in regard to the prescription. Whether this is so or not, we do know that some of the more advanced thinkers of the gas industry are persuaded that everything points to a lower calorific value gas of good combustible constitution being a possibility in the cause of a general economy; and their view is becoming more firmly established by the inflowing evidence, such as that in our article to-day which gives prominence to the personal views of the Chairman of the Board of Fuel Research, as expressed at a meeting of the Royal Society of Arts last week. The general position, Mr. Hunt agrees, is one which emphasizes our suggestion that the considered views of the gas industry should be laid before the Board of Fuel Research, with reference to the most economical methods of gas production and quality, and possibly applications—industrial and domestic. This is work that should be taken up by a Special Committee on behalf of the gas industry as a whole. But there is certainly no time to be lost.

The industry is in the position now, through conditions current and obviously prospective, when it can ask the consideration of the authorities and obtain large support from fuel-using manufacturers; and the opportunity is one which should not be missed. We therefore welcome the enterprise of the South Suburban Gas Company, of which Mr. Hunt is Chairman, in initiating an investigation on the lines suggested. Gas engineers and others who are interested will note the final words of Mr. Hunt's letter: "I need "hardly say that we shall gladly welcome the co-operation "of any who may be disposed to assist in the work, which "may prove to be of far-reaching importance."

National Gas Council and Unscreened Coal.

As there seems to be some misunderstanding in regard to the action of the National Gas Council as to the publication of the letter of the Ministry of Munitions relating to unscreened coal, we are authorized to say that, on receipt of the letter in question, the Council considered it right to send it out for the information of the gas industry generally. In view of the fact that many gas undertakings use unscreened gas coal, and indeed almost all the gas coal from the Durham field is supplied unscreened, the Council felt that there was no reason why the letter should not be circulated as desired. Since then, as no further instructions on the subject have been received from the Ministry of Munitions, it is assumed by the Council that the matter has been dropped.

Topics at the Society of British Gas Industries.

With the annual meeting of the members of the Society of British Gas Industries last Tuesday, there was brought to a close a year that has laid heavy claim on the Chairman (Mr. H. M. Thornton) and the members of the Council, especially in connection with the attempt to uphold the dignity and legitimate expectations and rights of the Society in association with the formation of the National Gas Council. Their non-success in obtaining full representation, through exclusion from the inner part of the Council, is now an old story. But the Society have not abandoned hope that the defect will be rectified. However, what was done by the late Chairman and the Council of the Society is something which has earned the gratitude of the members generally. They did their best; and no one can do more. Mr. Thornton is being succeeded by Mr. Percy F. Holmes as Chairman; and Mr. Archibald P. Main is the new Vice-Chairman. While the responsibilities upon them may not be so heavy as they have been upon their immediate predecessors in like office, they will, in the circumstances of the times, be heavier than is normally the case.

Crowning a crowded official year was the success of Mr. Thornton in inducing Sir Robert Hadfield, F.R.S., D.Sc., to accept the presidency of the Society; and thus continue the line of distinguished occupants of the position. The members of the Society are not satisfied with names only; their Presidents must be men whose deeds have made their names noted. Therefore, while acceptance of the office confers honour, so does the invitation to accept it. Sir Robert fully realizes this. But there are other considerations bearing upon his election. He has alliance with the gas industry, both as a Director of the Sheffield United Gas Company and as a considerable consumer of gas for industrial purposes. But independent of these ties, it is altogether a good thing to have the foremost leaders practising in other branches of the engineering industry brought into close contact with the gas industry, so that they may be in a position to get more intimately acquainted with its inner workings. There has been in the past too much confining of movement among engineers to fixed borders. Specialization is good up to a point; but inflexible specialization narrows competence. Science itself acknowledges no bounds, nor should those who practise the science of engineering—especially those engaged in industrial engineering. It is to the interest of those so engaged that they should be better acquainted with the gas industry's work; and that the engineers of the gas industry should know more of the work of other industries. It is to their mutual interests that there should be this interchange of knowledge; and more now than ever, in view of the place into which the gas industry is firmly growing as fuel suppliers for many purposes. Intercommunication spreads information as to what the gas industry can do; intercommunication gives the gas industry information as to what other industries want which it can supply. This is to the general good. Sir Robert's foremost technical interests are centred, as all the engineering world knows, in the steel industry; and it is in this industry that gas may be said to have driven its first big wedge in becoming suppliers of fuel gas for furnace and crucible heating. But while the Society's new President, in the address delivered to members last week, proved an already good acquaintance with gas, we are sure that, by the time he has finished his presidency of the Society, he will have by the closer contact largely supplemented his knowledge of the technical work of the industry. With this work he had already been further brought into touch by his chairmanship of the

Refractory Materials Committee of the Iron and Steel Institute, with which Committee the Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries has become united. Useful co-operation to mutual profit between industries can extend indefinitely, if only it is known what is wanted; but such knowledge is not gained by the technical men of industries always occupying distantly sequestrated grounds.

Sir Robert is no believer in those who have a fine fund of invective to be constantly drawn upon in respect of the shortcomings of this country. In technical invention and research of the order that has rendered the largest measure of good to humanity, this country has no peers; but, even so, he does not decry the scientific achievements of the enemy. At the same time, he is not blind to weaknesses in the national system—weaknesses that are discouraging rather than encouraging. Patent procedure is one of them; and, in the address he delivered last Wednesday, he puts this country into an unenviable place compared with the encouragement given the other side of the Atlantic. For some £7 the inventor in America can obtain a patent monopoly over the 52 American States for seventeen years, at a cost of no more than £7. To secure full protection throughout the British Empire for a shorter term of years, no less than forty patents are necessary, involving a first cost of some £1340, and a total charge of upwards of £2000. Sir Robert pleads for a universal patent for the Empire, and an amelioration of the burdensome charges and of the restricted protection. With this desire, Mr. Dugald Clerk, D.Sc., sympathizes. But the financial interests of the different components of the Empire are, in his opinion, obstacles that appear to be insurmountable. Governments should be above looking at the forfeiting of direct revenue from such a source when the act would tend to profit largely the Empire generally, and encourage inventors. Sir Robert has felt the inferior position of this country and its Dominions in the matter of patent costs and protection in the past; but he sees that the error of it will be conspicuously influential in the wrong way in the immediate future when the country's interests demand the maximum encouragement for the workers. To give this, there are the retarding conditions that require to be cleared away. The necessity is generally admitted; those who could do the clearing away are reluctant. It is of a piece with the shortsightedness which allowed much to drift from the resources of the Empire that could over long years have been used for its enrichment instead of that of the enemy.

At the meeting, Mr. H. A. Bennie Gray read an exceedingly interesting paper on the education and training of apprentices. The paper, with a report of the discussion, will be dealt with next week.

Sulphate of Ammonia and its Trading Basis.

Commercially, sulphate of ammonia has been the unlucky victim of the different Government departments under whose controlling dispensation and pricing it has come. The Sulphate of Ammonia Association, or the Advisory Committee drawn from the Association, have had a difficult, and not by any means pleasant, task in negotiating and settling terms with various Government bodies with whom they have had successively and at short intervals to deal; and it has never been possible for them to say that anything that was done had upon it the stamp of finality. Perhaps this was as well in the matter of the position created in February, when what was designated the equalization scheme was put forward, which belied its name by producing a certain amount of inequality as between the higher and the lower percentage ammonia makes of sulphate, and coincidently there was introduced some complication in reference to the payment for deliveries to home consumers. The latter has now been somewhat simplified in its operation, though in the financial result representing much the same thing as before; and the equalization scheme has been withdrawn.

The acceptance of this scheme was a voluntary matter; and only a few makers favourably responded—"a meagre "response" are the words of Mr. D. Milne Watson, the Chairman of the Advisory Committee—to the invitation to become parties to the scheme. The intention of the scheme was to enable makers in agricultural districts to sell the whole of their makes for home consumption, but at the same time give them a "fair share" in the higher prices obtainable for export. The intention as to economy in distribution was excellent; the equalization was far too indefinite—both from the quality standpoint and in the participation in any increased revenue obtained from the exported product. But comparatively little export of sulphate is taking place; and the demand at home is good, and likely this year to be larger still both by agriculturists and the Ministry of Munitions. If, or when, the conditions are restored enabling something in the nature of a similar scheme to be contemplated, it will have to more strictly define conditions that will produce equality all round, and be imposed upon, and its acceptance not left to the discretion of, the makers.

In the new scheme as to the payment for deliveries, the settling-up of accounts is transferred from the Advisory Committee to the Government. But excepting that the makers will now be assured that they will receive a net £15 10s. per ton (24½ p.ct. ammonia basis) for sales made to farmers, and £15 for sales made to merchants buying by rail, we cannot see they are any better off. The actual charges are the same as before—£16 to the farmers delivered at the railway station nearest the place of use, or £15 10s. to the merchants on rail at the makers' works. But 10s. per ton has now to be credited to the Government, who will defray the whole costs of delivery. Previously, the Government paid to the Advisory Committee 10s. per ton on all sulphate railed to a consumer's station; and from this governmental payment the Committee met claims (attested by railway accounts) for conveyance exceeding the 10s. per ton. It is not made clear in the circular, but we presume that the statement "makers will "be called upon to credit the Government with 10s. per "ton out of the price obtained from the buyers," only refers to the part of the product sent away by rail, and the delivery costs of which the Government are to defray? If not the makers will be worse off than before, as under the old scheme the payment of 10s. by the Government to the Advisory Committee referred to sulphate "railed to con-"sumer's station" [See Feb. 27, p. 422]. Anyway, under the restricted conditions, and the price of coal, labour, and sulphuric acid, the 10s. extra secured by sales direct to farmers is, in these hard times, a good incentive to try to get all the business possible without the intervention of the merchants.

Inert Gas Constituents and Inert Engineers.

The several references that have recently been made by us to the adulteration of gas with heavy percentages of inert constituents ought to have been sufficient warning; but we know that there are engineers who are going along quite heedless, and are making for themselves a thorny bed. The analyzing of gas for the specific purpose of ascertaining the quantity of incombustibles it contains, is not being confined to London and the suburban districts. Let there be no mistake about that. Sampling has been going on throughout the length of the land, and—mark this!—it is still proceeding.

Co-Operation between Chemist and Manager.

The old question of the relationship between chemist and manager was raised again in the address of Mr. W. Buckley to the members of the Manchester Junior Gas Association, as reported in last week's issue. Whenever this subject is put forward, the chemist always gets the best of the argument, because his argument is the commonsense one. The legitimate association of chemist and manager is co-operative, and not antagonistic. Where the latter is the case, the highest working efficiency cannot possibly reign. Mr. Buckley spoke plainly. He knows it is true that some managers do not look with favourable eye upon the chemist; and what he knows to be true he states without equivocation. He asks why it is? Again he does not mince his words. He says: "The business of the chemist is to find and report the truth; and the truth is at times unpalatable to the manager." In these days, it ought to be impossible to find any foundation for such a statement; but it is fortunate for everybody that it is not universally applicable. It would be a disastrous thing for the gas industry if it were—especially in these days when gas-works processes and productions are developing in manner that renders more and more necessary chemical control. Mr. Buckley will make some old retort-house foremen shake their heads when he suggests that the empirical methods of the retort-

house shall be displaced by efficient control, which shall aim at the maximum yield of gas per ton—but it must be the maximum possible of combustible gas—on the lowest expenditure of fuel. The realization of these results is much the work of the chemist, who is capable of earning, through the savings effected by his work, much more than his own salary. "A saving of 1 per cent. of fuel on a works carbonizing 50 tons of coal per day will more than pay the remuneration offered to the chemist by many undertakings." If some managers will calculate this out, they may see that there are others besides the prisoner gas workers in Germany with their few pfennigs reward per day who deserve their pity. Yet the chemist ought to be a collaborator, and not an ill-paid underling very low down in the staff scale.

The Competitor's Movements.

"Wanted, a Special Committee," was the title of an article that appeared in our columns last week. It was merely the successor of several others, the first dating from July 25 last year, when we wrote under the heading of "Movements over the Way." In that article of nine months ago it was stated that the electrical industry "is going to make an effort to spread, deepen, and consolidate the base of the industry, and thus make more secure the electrical edifice above." The gas industry, it was then also said, should be interested; it being pointed out that everything that went to strengthen the electricity industry improved its competitive position and power. From the time interlinking was first raised in that industry, as well as other plans for consolidating its position, the matter has been maintained in prominence editorially and in our "Electricity Supply Memoranda;" and the gas industry has been urged to keep pace with these movements by entering with deliberation into the question of what can be done to improve its own economic position. The two opening paragraphs in our "Electricity Supply Memoranda" to-day ought to convince of their error those who have been looking upon the "liveliness" in the electricity industry as something ephemeral. It is real and general, and it is not going to die-down, because the belief is there that something good which will mean advance can be accomplished, and because of the encouragement being given from the hands of the Board of Trade.

Expectations.

We are hopeful this matter will not be ignored in the gas industry, which for years suffered badly from a disposition to preserve antiquated policies, and to procrastinate in dealing with new positions. That there is a fresh spirit abroad in the industry, we are satisfied. Contrast the situation to-day with that when the "Journal" article appeared on July 20, 1909, on the question of "Better Organization in the Gas Industry," with that when in its columns—this was during the run of the Earl's Court Exhibition—the article was published which gave birth to the Society of British Gas Industries, and with that when (many years have passed since then) the articles appeared urging the juniors of the gas industry to "Wake up." We are satisfied with the results of these suggestions and efforts. Many of the juniors of those days of long ago are now leavening the senior ranks. The inertia of the past is dying-down. Potent forces have been set to work to the advantage of the gas industry; and we are not without hope that the activity of our competitors in the attempt to reinforce their economic position will have upon the men of the gas industry a beneficial effect in the direction of inducing them to take seriously in hand the work of surveying our own position, so as to ascertain whether from the technical side more cannot be done to strengthen the operating power on the commercial side—suggestions directing to which have been brought together in recent articles in these columns.

Temporary Exchange of Assistants.

A unique scheme is in the mind of Mr. Samuel Tagg, of Preston; and though the matter may be a little difficult to arrange, he is sanguine that it will have sufficient support to ensure a trial. When some years ago we were stimulating the juniors to establish for themselves organizations (only the Manchester Junior Association was then in existence), we made a point of the opportunity that such organizations would give not only for the dissemination of information among the younger members of the gas profession, and for promoting their abilities in preparing papers and taking part in discussions, but for broadening knowledge and experience by paying visits to various gas-works, and inspecting operations under the individually prevailing conditions. Prior to that, assistants were very much kept at "home," and had not much chance of enlarging their outlook upon things engineering and managerial by getting out of the daily rut. What was then predicted, and what has since been proved, has come to pass, by the juniors freely taking advantage of the opportunity of making works' visits. But Mr. Tagg now suggests a scheme that is a development upon this. He proposes that assistants should be something more than visitors—that for a period they should live at other works than their own. His scheme was outlined in a speech made at the recent meeting of the Manchester Junior Gas Association [*ante*, pp. 98-99]. He states that for some time he has had in mind the advantages of arranging for the exchange of junior assistants for a period of a few weeks, and that the assistants should share in the ordinary routine duties at works in which they were temporarily located. He has already spoken to a number of engineers who are favourable to the scheme; and he hopes, on the safe return of those who are serving their country, to give it a trial. There are great educational possibilities in the proposal; but it is one that would require to be planned out carefully and definitely in detail, as, of course, a certain amount of dislocation would occur by the changing about. But the gain would be worth that, and much more.

Automatic Lighting in Country Roads.

A section of the address of Mr. J. J. Scott to the members of the Eastern District of the Scottish Junior Association [published elsewhere in this issue] should do much to promote the use of automatic lighting arrangements in country districts. He uses the "A. & M." pressure wave system in the lighting of country roads; and he finds it pays. The failures of the apparatus and by-passes, as seen by the tabulated data for three years, are infinitesimal compared with the total number of actuations; and in the last year for which the record is given (1914-15), the failures were lowest of all. Seeing this is April, 1917, we wonder why later figures were not supplied than those for 1914-15. A change that resulted profitably was in the conversion of the lamps in 1913-14 from the upright to the inverted type. "The expense was recovered the following year by the saving on mantles alone; while a great improvement was effected in the illumination." Good is the testimony to the virtues of automatic control for outlying districts and of inverted burners.

National Thrift.

So many War Savings Associations have been formed in connection with gas undertakings, that there is little doubt employees in this industry will be as gratified as those in any other on perusing the satisfactory figures revealed by the first annual report of the National War Savings Committee. These figures make quite clear how important, when properly directed, may become the influence of the "small purse" on the finances of the nation. It seems from the report that from the outbreak of war until the end of 1916, small investors subscribed £118,179,000, excluding all £500 War Savings Certificates, which realized £14,250,000. With regard to War Savings Certificates, while up to the end of December last £42,183,718 had been subscribed for these, no more than £287,448 of the certificates had been cashed and redeemed. Very gratifying, indeed. And it has to be remembered, of course, that it is since the period to which this report was made up that the great Victory Loan movement has taken place. As the result of this, the figures for 1917 must, when they come to be published, prove infinitely more striking than those for the past year. The fact may be mentioned, as some indication of what is to be anticipated, that 10,000 new local War Savings Associations were formed in the first two months of this year. There have, indeed, been as many as 26,500 War Savings Associations created and affiliated to the Central Committee; and there are also 1100 Local Committees for propaganda and organization purposes, as well as an unknown number of unaffiliated Associations operating through the post office. Between 2,000,000 and 3,000,000 members are on the books; and a feature of the matter which is generally recognized is that these members have been drawn from classes which have hitherto only too often found it difficult, or even impossible, to save. The total expenditure of the National War Savings Committee since its formation has, it is pointed out, amounted to less than 2s. per £100 lent.

PERSONAL.

An advertisement which appears on another page of this issue for an Engineer and Manager to the Sittingbourne District Gas Company, is necessitated by the fact that Mr. F. A. West, who has held the position for just about a year, has now been appointed to a similar position with the Newark Gas Company. Previous to going to Sittingbourne, Mr. West was Assistant Engineer, Manager, and Secretary under Mr. James Donaldson, at Tonbridge.

Councillor J. H. Buckley, Manager of the Formby Gas Company, Ltd., has been re-elected Chairman of the Formby Urban District Council. In such an action, precedent and unwritten law went by the board, for there had been an understanding that "honours should go round," and the Vice-Chairman has usually been promoted to the higher office. Councillor Buckley has been very successful in the chair; and the prospect of peace being celebrated during his year of office had something to do with his re-election. There was some opposition, but only because of the unwritten law and precedent.

OBITUARY.

FRANCIS SUTTON.

Francis Sutton, F.I.C., F.C.S., Ph.C., the well-known author of "Volumetric Analysis," died at Norwich last Tuesday, aged 86. He was County Analyst for Norfolk and the Borough of Great Yarmouth, Consulting Chemist to the Norfolk Chamber of Agriculture, and Gas Examiner for the City of Norwich.

Mr. Sutton was originally a pharmacist practising in Norwich, and served for many years on the Council of the Pharmaceutical Society, and in 1874 represented British Pharmacy at the International Pharmaceutical Conference at St. Petersburg, continuing a Corresponding Member of the Imperial Pharmaceutical Society of that city, and also of the Apotheka Verein of Vienna. He discarded pharmacy in 1876 for practice as an analytical and consulting chemist. Previous to this, however, he established, and became Managing Director of, a works at Great Yarmouth for the manufacture of sulphuric and muriatic acids, chemical fertilizers, and sulphate of ammonia. The gas liquor produced by the British Gas Light Company at Norwich was then a waste product and a source of nuisance, and was in the early days obtained without payment, and transported by "wherry" [the local sailing barge] to Yarmouth for manufacture into sulphate—the price of that material being then £25 per ton. The factory was subsequently, in 1894, acquired by Messrs. Prentice Bros., Ltd., who still carry it on.

It is by his book on "Volumetric Analysis" that Mr. Sutton's name is best known, and which has made his name familiar to chemists all over the English speaking world. The first edition was published in 1863. The tenth edition (edited by Messrs. W. L. Sutton and A. E. Johnson) is just out of print; and the eleventh edition is now in preparation. A French translation of the fourth edition was made by Dr. Mehu, and published in Paris in 1883. Mr. Sutton's eldest son is Mr. F. Napier Sutton, F.I.C., who is also well known to readers of the "Journal" in connection with the work that he has done as an Inspector under the Alkali Acts.

Mr. George Ennis, of Wrotham, Kent, and the Middle Temple, who died last Tuesday, aged 76, was well known to those who attend gas companies' meetings in London. Many years ago, he was an Auditor of the old Phœnix Gas Company.

Mr. William D. Helps, of Leeds, has suffered a sad loss by the death of his wife, who passed peacefully away on Thursday last, after a long and painful illness. Sympathy with him will be felt by Mr. Helps's friends, many of whom had often met his wife on the occasions of the annual excursions of the Institution of Gas Engineers, which she always enjoyed attending. The interment took place at Kirkstall Church yesterday.

A highly-promising career has been cut short by the death of Lieutenant Alexander P. Wilson (younger son of Mr. Alexander Wilson, the Engineer and General Manager of the Glasgow Corporation Gas Department), who has been killed at the front. Prior to the war he was training as a gas engineer in the Corporation service, and was also a student at the Royal Glasgow Technical College. He had gone through a practical and office training, and had passed nearly all the examinations required for entering the course of engineering at the University when the war broke out. At once, on the formation of the Chamber of Commerce Battalion, he joined it, and rose to the rank of Lieutenant. Subsequently, he volunteered for service in the Royal Flying Corps, in which he was gallantly serving his country when he met his death. In a letter to Mr. Wilson, the Commanding Officer of the R.F.C. Squadron says that Lieutenant Wilson was brought down by a hostile machine while out on artillery patrol. He adds: "Your son is a tremendous loss to us. He was one of our best observers; and if he had gone home to learn to fly, I was putting him in for promotion to Flight Commander. He was one of the most gallant fellows I have ever met, and always most willing to undertake any work. Everyone in the Squadron had the greatest admiration and affection for him. He had a great sense of duty; and he lived up to it wonderfully." It may, in fact, be said that, though he was keen on work and education, he was, from his happy disposition, a great favourite with all who knew him. He was 23 years of age.

THE LATE MR. A. F. WILSON.

Mr. R. W. Edwards, the General Manager of the Aldershot Gas, Water, and District Lighting Company, sends the following particulars about the career of the late Mr. A. F. Wilson, whose death was referred to in last week's issue.

It is with the greatest regret that the Company learned, on the 12th inst., of the death that morning of Mr. Alexander F. Wilson, at his residence, "Burnbrae," Balfron, Stirlingshire.

Mr. Wilson, who had reached an advanced age, had been associated with the Company for upwards of forty-two years, as Engineer, Director, and (for a period of nearly twenty-eight years) Chairman. He was a dour Scot of the quiet, but effective type. He received his original training in the gas engineering profession under Mr. John L. Kay, the Joint Engineer to the Dundee Gaslight Companies; and so far back as April, 1858, he became Manager (and directly afterwards Treasurer also) of the New Gas Company, Perth, which position he occupied for some four years. He next took up a position with the Phœnix Gaslight and Coke Company—a Company long ago assimilated by the South Metropolitan Gas Company.

After remaining with the Company for some time, Mr. Wilson—anxious to find scope for his organizing abilities—turned his attention to fields far away. The City of Parà was just being lighted with gas; and Mr. Wilson obtained the post of Agent and Manager for the Company in that city. Here he remained for some seven years—retiring from the position on Dec. 31, 1872, to become Consulting Engineer. In Parà he did yeoman service, particularly in the training of native workers; and, from contemporary records, his loss appears to have been deeply felt.

On his return to England, he practised as a Consulting Engineer; and in December, 1874, he became connected with the Aldershot Gas and Water Company—a connection only now severed by his death. He became a Director of the Company in July, 1881; and in the following year he was elected Chairman—a position he retained till February, 1910, when he relinquished it in favour of Mr. W. T. Robertson, J.P., the present occupant of the chair.

Calorific Standard Applications and Order.—Application has been made to the Board of Trade for Calorific Standard Orders by the Bexhill Water and Gas Company, the Croydon Gas Company, and the Redhill Gas Company. The Board have made an Order for the Bothwell and Uddingston Gas Company, Ltd.

Colours Applied to Storage Tanks.—According to a paper read at Philadelphia by Mr. H. A. Gardner, says the "Scientific American," in considering the effects of the different types of rays of which light is composed, it is found that the calorific or heat-producing rays are conducted by painted objects in a widely varying degree. This fact should be studied by anyone who is called upon to paint metal oil-tanks. Such tanks may contain light distillates, which, upon becoming warm, produce highly expansible vapours. When black or dark-coloured paints have been used, rapid absorption takes place, and considerable losses by evaporation are apt to occur. White or light coloured paint should, therefore, be used for the finishing coat on oil-storage tanks. Paints presenting a high gloss are, moreover, less absorptive of thermal rays than those presenting a duller surface. The experiment was made of exposing a number of small tanks containing benzene, painted in various colours with a gloss finish, to the rays of a carbon arc for a period of fifteen minutes. The rise in temperature of the benzene in degrees Fahr. was: Black paint, 54°; light gray, 26·3°; white paint, 22·5°; aluminium paint, 20·5; and tin paint, 19·8°.

Eastern Counties Gas Managers' Association.—It has already been announced in the "Journal" that the meeting of the Association is to take place on Thursday, the 3rd prox., at the Holborn Restaurant—the business being preceded by luncheon as the guests of the Chairman and Directors of the Great Grimsby Gas Company. In addition to the Presidential Address of Mr. J. Terrace, a paper is to be read by Mr. E. F. Keable, of Gorleston, on "Benzol Recovery at Gorleston by a Modified Dehydrating Plant." Subsequently, the following resolution will be proposed by Mr. W. W. Townsend, of Colchester: "That this meeting requests the National Gas Council to take immediate steps to bring to the notice of the Ministry of Munitions the difficulties experienced by the members in obtaining necessary plant and machinery, and submits that, in view of the important work being performed by the gas industry, priority should be given for plant which is shown to be urgently needed for carrying on the business." The *agenda* includes a proposed alteration of rules, substituting "vice-president" for "senior vice-president" and "junior vice-president" in Rule 6, and "vice-president" for "vice-presidents" in Rule 7.

DEMONSTRATING THE INDUSTRIAL USES OF GAS IN LONDON.

The uses of gas in industrial heating operations have now such substantially proved advantages, and the applications of gas methods are now at flood-tide in connection with munition work, that no more opportune time could possibly be at which to use every effort to bring manufacturers who have not had experience of all the demonstrable virtues of gas for the multifarious purposes of industry into direct contact with them. The Gas Light and Coke Company appreciate this; and so they have arranged to place their excellently designed furnace demonstration shop (which they erected some time ago at their City depôt, No. 146, Goswell Road, E.C.) at the disposal in turn of the leading firms engaged in the design, construction, and supply of the great variety of furnaces, crucibles, ovens, and other appliances now obtainable, for the exhibition and demonstration of their uses to manufacturers. This is a good use for the demonstration shop, which, reminder may be given, was established to afford manufacturers an opportunity to inspect all kinds of gas-heated appliances for use in the numerous industrial processes in which heat is employed, and to make experiments in the application of gaseous heating to their own special and particular requirements. Of this opportunity, manufacturers have availed themselves in large and increasing numbers, especially during war time, when so many factories have had to adopt new methods to enable them to economize labour in the carrying on of their former business, or to change altogether the character of that business, and produce necessaries of war instead of necessaries or luxuries of peace.

The first of the special exhibitions referred to has been arranged by Messrs. John Wright and Company, of Aston, Birmingham. It was opened yesterday week by Mr. D. Milne Watson, the Managing Director of the Gas Light and Coke Company, and will continue open until Saturday, May 12. This will give our readers plenty of time to pay a visit of inspection. Demonstrations of metal melting, hardening of high-speed steel, annealing, &c., will be given daily from 11 a.m. to 1 p.m. and 2.30 to 5.30 p.m. Manufacturers can have tests made with their own material by arrangement with the Company.

Some of the Exhibits.

The display of furnaces by Messrs. John Wright & Co. is excellently representative, but far from exhaustive. There are furnaces large and furnaces small; and all fitted for demonstrating their efficiency, and for making the fullest inspection and investigation, by the aid of the capable men in charge. Prominent among the exhibits is one of the "Lip-Axis" crucible tilting furnaces, capable of dealing with 600 lbs. of brass, and constructed for pouring direct into moulds. We need not describe the construction of this or the other furnaces on view, as they have been frequently referred to in our columns. Another exhibit is the "Lopress" regenerative annealing furnace, with oven 6 ft. × 4 ft. × 2 ft. Also seen are a small and a large high-speed tool steel furnace. The next important object of interest is a shell-nosing furnace for heating simultaneously three 4·5 shells. Two pit type crucible melting-furnaces are noticed—one with a 60-lb. pot and the other with a 100-lb. pot. Among the other exhibits are a large regenerative oven furnace, case-hardening muffle furnaces, a cyanide furnace, and a quenching bath.

A large number of representatives of manufacturing firms were present at the opening of the exhibition, and to inspect the exhibits.

A Welcome to the Visitors.

In a room in the main building, the visitors subsequently assembled, and were welcomed by Mr. D. Milne Watson, and then had the pleasure of listening to an extempore lecture by Mr. Shipley N. Brayshaw.

Mr. Milne Watson, in welcoming the visitors, said the exhibition had been undertaken by the Gas Light and Coke Company with the view of showing the best that could be done by the latest gas-furnaces made by Messrs. John Wright & Co. It was impossible, of course, at one time and in one place, to show all the various furnaces that were now made, because there were now several makers in the market. It was therefore felt that, by having an exhibition of one maker now, and possibly later on exhibitions of other makers' goods, it would be possible to show in London what was being done by the various firms in this trade to solve the question of applying gas heating to the melting and treatment of metals. He had therefore great pleasure, on behalf of the Directors of the Gas Light and Coke Company, in declaring the exhibition open. He should like to say that they all felt this departure of gas to industrial heating was of considerable importance. A good many people still imagined that gas was simply an old-fashioned means of lighting. He supposed these people had never come to recognize that it was a means of industrial heating, and that in this direction gas undertakings had a good future. They looked forward to the time when the demand for gas in this direction would be much greater than it was at present. The Gas Light and Coke Company recognized that the industrial heating field was going to be a large one in the future; and with the object of bringing this department of their work before the public, they erected the industrial demonstration shop, which had been seen that day. The shop could now be filled many times over with specimens of different apparatus that had since been invented for industrial work. However, it served its purpose, because it brought before manufacturers the various gas appliances that the makers had invented. He was sure the exhibition was a move in the right direction; and he hoped it would be followed by others of a similar character. There was a considerable debt of gratitude due to firms like Messrs. John Wright and Co., who had done so much for industry in this way. He should like to say to Mr. Yates, of the firm, how much the Gas Light Company appreciated their efforts. The Company considered they did a good deal themselves in the way of advertising gas; but without the assistance of these gentlemen, who were experts, they could not make the progress that they did. Not only the Gas Light Company but all gas undertakings were under a debt to the gentlemen who devoted so much time and ability to this business.

Mr. H. James Yates said he would like, before Mr. Brayshaw gave his lecture, to say how much he personally appreciated the kind words Mr. Milne Watson had used with regard to the work his firm had done in this important industry of gas-furnace production. They were also greatly indebted to the Gas Light and Coke Company for allowing them to come there; and he hoped the business resulting from the demonstrations would be to their mutual benefit.

AN EXTEMPORE LECTURE.

Experiences at the Royal Mint.

Mr. Shipley N. Brayshaw then delivered an extempore lecture, from which a few points may be given. Among other things he said that he really felt they were only at the beginning of things in gas—gas was going to be used enormously more in the future than it had been in the past. At the Institute of Metals a few weeks ago, papers were read on the subject of the melting of metals by gas. But there was one paper that stood out prominently from all the rest. That was one by Mr. Hocking, which showed what had been done in melting by gas at the Royal Mint. It was not a case of something experimental; it was not a case of stating the results of a few tests; but he talked of the melting of 10,000 tons of metal in the course of five years. And he was able to give the whole of the costs for the five-year period, in comparison with the costs in the preceding period when coke was used. Mr. Hocking was in a position to say that with regard to the cost of fuel, pots (which was a very important item), and labour, gas had cheapened production all round. Various criticisms might be made; for instance, people who were using coke might say: "Yes, but to begin with, his coke costs were high. He was spending so much per hundredweight when using coke; we spend less than that." It was perfectly true that the coke costs were high, and so were the gas costs for the same reasons. At the Mint, they were working under extreme conditions; there were certain limitations there which did not obtain in any ordinary brass foundry. It might be expected that a brass foundry would work very much cheaper than a place where they had to take such care as had to be exercised at the Royal Mint. Many of the metals melted there required a high temperature. Silver and gold were melted, as well as a good deal of cupro-nickel for colonial coinage. The Mint found that, under their conditions, when they changed from coke to gas, great economy was effected. The same thing had been found true at many factories which started at a lower level of cost. Coke was cheap; but gas was cheaper still.

An Experience with Platinum.

In the demonstration room would be noticed the "Lip-Axis" crucible furnace, in which the axis was on a level with the lip, so that the lip did not move very much when tilting. The furnace on view was for treating 600 lbs. of metal. This furnace was doing melting in factories on a big scale cheaper, he supposed, than had ever been done before under like conditions. The firm of Messrs. Johnson, Matthey, & Co., who dealt with large quantities of precious metals—platinum, gold, and so forth—used one of the Brayshaw burners, similar to those employed at the Royal Mint. On one occasion they placed a 1000 oz. ingot of platinum in a gas-furnace, and directed the burner upon it. They left it too long; and found it dripping at the corners. This was with a coal-gas flame with no pre-heating, or use of oxygen—simply by the use of coal gas and air.

High Temperatures in Quick Time in the Potteries.

At their own works, they were testing some firebrick, in a brick-testing furnace, measuring about 1 foot cube inside. They put the refractory material under test into this furnace, ran it some time, and then took the temperature—not on one spot just where the flame was impinging. People could get wonderful temperatures by doing this; but, in the case of this furnace, they took the temperature in the centre, and without the flame impinging on the brick at all. The temperature was taken with an optical pyrometer made by the Cambridge Instrument Company; and the temperature reached was 1800° C. He fancied this was rather a unique performance. The pyrometer was verified afterwards, because they could hardly believe that the temperature really was so high. But there was no room for doubt that they did get the temperature named. The interior of the furnace corroborated it [Laughter]; and it was rather an expensive process working at a temperature of 1800° C. Just lately they had been putting up some experimental furnaces at the Potteries laboratory, at Stoke-on-Trent. One furnace was 6 ft. × 6 ft. × 3 ft. wide, so that was a good size. There was room enough in it for six persons, and eight of his own size. The furnace was built-up with saggers, which were kind of boxes, in which were packed the ware. A pyrometer was put in each of the saggers; and they ran them for a day. Their people, however, could hardly go slow enough for the Potteries. The custom there was to heat-up in three days, while their own men were accustomed to heat up with gas in (say) a couple of hours. So the men had a tendency to break loose, and to run up the heats too quickly. On this occasion, they put the furnace to what was thought locally to be a severe test; and in about nine hours they found the temperature was uniform from top to bottom and from front to back. They then ran another three hours; and after the twelve hours' heating, they found that the temperature was up to 1310° C. The furnace was then put out. The main question there was the evenness of the temperature; and if they had taken three days they could not have expected to get it more uniform. Dr. Mellor said to him after the test, that if they had told him beforehand they could get the results which were actually achieved,

he would have said it was impossible. He simply reported that the Seger cones showed an extreme evenness of temperature right through the furnace. He (Mr. Brayshaw) mentioned this to show what they were doing in arranging to attack and solve new problems. They knew about steels and reducing atmospheres; but it was a new thing to get high temperatures with an oxidizing atmosphere.

Working with Low-Pressure Air.

There was another special point about this temperature; it was nowhere near their limit. They got it by burning 2000 c.ft. of gas; and they could have gone on burning up to 3000 c.ft. Therefore they could have realized a much higher temperature than the 1310° C., which was obtained by using gas at the pressure in the main, with air at a pressure (this was never exceeded) of 5 in. water column. He fancied this was also a unique performance. High-temperature gas-furnaces were coming into use very much more rapidly now that they could use low-pressure air. People used to talk of the cost of the gas, and they also had an eye to the cost of the air. The compressing of the air cost something, and so did the plant. Some air-compressing plants they had had to do with cost thousands of pounds; but working with only a few inches pressure of air, this merely meant a fan. It just required a fan rotating at high speed to send it along the pipes; and, as he said, 5 in. water column was the maximum used in the Potteries furnace trial.

Furnaces for Steel Work.

Another furnace of which Messrs. John Wright & Co. had sold large numbers was being used in Sheffield, for the heat treatment of steel and for the annealing of steel. One point (it could be demonstrated that afternoon) was that in this furnace they had to produce smoke, or what was called a "greasy" flame, to any extent required. In some trades, black smoke inside the furnace would shock people. In the Potteries trade, black smoke would condemn the furnace for ever. In Sheffield, it was a prominent virtue to be able to produce a greasy atmosphere in the furnace. There they could make it as dense as they liked—in fact, so that they could only see (say) a foot inside the furnace. This meant that the surface of the steel under these conditions could not be decarburized. Mr. Brayshaw proceeded to refer to the numerous directions in which this heat treatment was applied to steel work; and he also explained the objects and effects of the treatment. The "Lopress" furnace was one with which they could get any temperature required. It would easily run up to 1000° C., or even to 1400° C., if desired. During that time the atmosphere could be regularly adjusted to the point required, and might be oxidizing, carburizing, or neutral. The furnace was worked with an air pressure of 3 or 4 in. water column, and the gas at the pressure in the town main.

Heating and Hardening Tool Steel.

There was also the salt bath furnace for the heating of tool steel or carbon steel. High-speed steel had come in for tools, and so people thought that carbon steel was "out of it." But there were many cases where carbon steel was still used—such as for cams in machinery, and for certain kinds of tools as well. In this case, the tools were let down into a bath of liquid, where they were stirred up and down. What they claimed was—and everybody must concede this—that the pyrometer, being all the time in the liquid, told the temperature of the liquid; and, the tools being stirred about in the liquid, they were also informed as to the temperature of the work. In the ordinary way, although a pyrometer was a good guide, it did not tell them truly the temperature of the work; but they claimed that, in their salt bath furnace, the work being in the liquid, the pyrometer told them the temperature of both the liquid and the work. There were also the furnaces for hardening high-speed steel. In the twin chamber furnace, the heat went into the bottom one, and carried it up to a high temperature. The products of combustion from the lower chamber flowed into the top chamber, which they heated up. In this upper chamber, the tools were pre-heated, and then were "promoted" to the hotter place down below. There they got the final heating that was necessary, and were then quenched in a patent liquid of fused salts. There were many people now on the market with twin-chamber furnaces; but these twin-chamber furnaces were put on the market far ahead of those of anybody else, for the reason that they were tool makers, and they wanted these temperatures to harden their own tools. When furnaces were made and sold by tool makers, their furnaces were likely to be the best for other tool makers. Thus it was that the tool makers in this country in most cases were hardening with the Wright furnaces; and so were competing with the Company's cutter department with tools that had been hardened by furnaces supplied by their furnace department.

Only at the Beginning of Things.

Concluding his lecture, Mr. Brayshaw said he felt that they were only just at the beginning of things with gas. Gas was going to be used ever so much more in the future than in the past. It was always under control; and they could be quite sure of what they were doing with it. It was clean; and he had no doubt that all these processes in time would be carried out by heat obtained by gas fuel. What they were now showing was but the commencement; and it was only an indication of the general run of furnaces that were even now being made.

Mr. Milne Watson proposed a hearty vote of thanks to Mr. Brayshaw for his lecture.

Mr. F. W. Goodenough, in seconding, said that, if any of the manufacturers who were represented there wished to have fuel problems gone into at their works, as well as follow up what they were able to see in the demonstration room, the Company had experts on their staff whom they would be glad to put at the disposal of the manufacturers to go into any heating problems on which they wished for advice. This would not commit them to employ gas as fuel. All the advice given would be without consideration or obligation.

The vote was heartily carried; and Mr. Brayshaw's acknowledgment ended the interesting interlude. Several of the visitors, after tea, made their way back again to the furnace demonstration room to indulge in further investigation of the furnaces in action.

On May 2, at 2.30, Mr. E. Russell Brayshaw will lecture on the "Practical Applications of Gas as a Fuel."

SIXTY YEARS AGO.

From the "Journal" for April, 1857.

Utilization of Ammonia.—The steady advance in the price of the ammoniacal compounds now so much used as fertilizing agents throughout the country, compels us once more to direct attention to the large waste of ammonia which takes place not only in most of our Provincial gas-works, but also in many of the Metropolitan ones. As a general rule, it seems to be considered sufficient, even in London, to sell the ammoniacal liquor at a reasonable price; but when we know, as we now do, that twice as much ammonia exists in the gas as is contained in the ammoniacal liquor, we feel that the directors of the gas-works, even in London, are at present only realizing the homely adage of "saving at the tap and letting flow at the bung." We have heard no end of outcry concerning the value of London sewage from an agricultural point of view. It is now, however, pretty well conceded that to extract manure from London sewage, is to earn a sovereign at the expense of thirty shillings. But widely reverse is the case of the ammonia contained in coal gas. It is easily got, and can be rendered marketable with the least possible trouble. Nay, more, such is the apparent indifference or ignorance of the gas world at large to its value, that we venture to assert, without much fear of contradiction, that nine-tenths of the gas companies in Great Britain would allow any respectable manufacturer to remove the ammonia from the gas they send out, without even dreaming of asking anything for it. We specially record this as the existing state of things at the present moment, because we feel that so remarkable a condition of affairs cannot long continue with sulphate of ammonia, as it is, at £17 and £18 per ton. We are told that "There is a tide in the affairs of men which, taken at the flood, leads on to fortune;" and certainly the ammonia tide in reference to gas is now at its flood for all those who have talent and industry to take advantage of it. The ammoniacal liquor question is a worn-out tale; and the modes of dealing with it too well known to offer any inducement to those whose aim is "progress;" but the impure gas still remains as it was twenty years ago, and with reference to the ammonia contained in the purifying materials, little or nothing has been done. True, indeed, Mr. F. J. Evans, of the Chartered Gas-Works, Westminster, is now utilizing this ammonia to a great extent, and deserves the thanks of his professional brethren for pointing out a way which all may follow; but this is the exception, and stands painfully apart, rebuking—as it were, the apathy which it cannot stimulate into exertion. In ventilating or re-oxidizing the sulphuret of iron formed in the purification of the gas, Mr. Evans finds sufficient ammonia evolved from each one of his 18-ft. square purifiers to saturate one ton of sulphuric acid, and convert it into a pure white sulphate of ammonia. Can a fact like this pass unnoticed? or are we no better than savages, willing to throw away gold to gather tinsel? Here is a plain, simple tale, capable of demonstration at any moment, and which shows that, without expense, and positively with benefit to the surrounding neighbourhood, a ton of sulphuric acid, worth (say) £8, may be made to absorb an article hitherto wasted, and by which the ton of acid is greatly increased in weight, and is positively increased in value from £8 to £18.

Hygienic Refuse Disposal.

Few matters could be more important in connection with residential premises than the proper disposal of the refuse; and thus it is not surprising that the question should, even in times of peace, have been the subject of earnest attention at the hands of hygienists. The need for keeping in mind the danger to the public health involved in the insanitary treatment of domestic refuse is, however, now more urgent than before the war, inasmuch as shortage of labour has compelled in many directions the restriction of the facilities for collection which normally exist—at any rate, in many important towns. In these circumstances, the British Commercial Gas Association have done well to devote the April issue of "A Thousand-and-One Uses for Gas" to discusing the "Importance of Hygienic Refuse Disposal." The article points out the harm—in the shape of serious outbreaks of diseases such as typhoid and infantile diarrhœa—that may result during the coming summer from the defective sanitary service; the menace of the house-fly in this connection being explained. Happily, there is a simple means of avoiding the risks portrayed; and it is a method that can be adopted by everyone. That is to say, the refuse can be burned; and in the article it is shown how suitable gas is for this purpose. One of the most modern types of gas-fired incinerator is illustrated and described—as it already has been in the pages of the "Journal"—and reference is also made to the use of coke-furnaces for destroying refuse in institutions and large houses. The issue is one that should prove of value to both gas undertakings and their consumers.

Gas for Poultry Farming.—In a Pacific Coast Gas Association "wrinkle," Mr. H. Bostwick referred to the use of gas for incubation and brooding of young chicks. He said he had been told by the representative of one of the gas concerns in California that there is a monthly consumption of nearly 1,500,000 c.ft. in his district for this purpose alone. This use of gas has displaced other methods; and gas has been found to be most reliable and economical. The consumers make a saving of from 25 to 30 p.ct.

ELECTRICITY SUPPLY MEMORANDA.

In our editorial columns last week, there appeared an article under the heading of "Wanted, a Special Committee," and the previous week there was one on "Interlinking in the Gas Industry."

Liveliness in the Electricity Supply Industry.

In both these articles and in the "Memoranda" lately, reference has been made to the work that is going forward in the electrical industry with the view to reorganizing it on a broader or national basis, and to realize a general economy. The "Electrical Review" has been emphasizing the growth to the present position of this work in the short space of twelve months; and it sees prospects of its maturing if no malignant influence intervenes. To show the leaders and the active spirits of the gas industry how quickly events have been moving, and with what unanimity, we skim, in the succeeding paragraph, the article in our electrical contemporary. Of course, although movements have been rapid, results lie in the lap of the future. But it will be seen that the electrical industry generally is persuaded that something must and can be done to make its work greater and more effective through the achievement of a better economy than has hitherto been attained. At the same time, it seems to us, as before said, that the question of the realization of a larger economy in the electricity industry is wrapped up with the work of the Board of Fuel Research; and their investigation into the utilization of fuel in that industry, and its relation to the work of the coal-carbonizing industries, ought to precede that of the Departmental Committee appointed by the Board of Trade to consider the question of the supply of cheaper power.

A Busy Year.

By the article in the "Electrical Review," we are reminded that about a year ago at the Institution of Electrical Engineers, Mr. E. T. Williams introduced a discussion on the position of electricity supply in the United Kingdom, and the steps to be taken to improve and strengthen it. This helped to focus attention on the question of electricity supply from the national standpoint. In May came the circular of the Board of Trade, urging the interconnection and joint working of electric-supply undertakings of all kinds, and offering to facilitate the carrying out of such schemes. Events showed that those most concerned fully appreciated the situation, and that the electric-supply authorities in Lancashire and Cheshire had even anticipated the Board of Trade circular, by forming a Committee to prepare a scheme of interconnection where feasible in those counties. June came; and at the meeting of the Incorporated Municipal Electrical Association, a paper by Mr. Ellis echoed the demand for organization of the electricity supply of the country. Subsequently, it was announced that the Council of the Institution of Electrical Engineers had appointed a Committee to consider the present and future of electricity supply in this country; and almost simultaneously came the announcement that a Joint Committee of the Municipal Electrical Association and electric power companies had been formed to investigate the same matter. The next public references were at the meeting of the British Association in September, where, when discussing the question of fuel economy, Mr. C. H. Merz emphasized the necessity of centralizing production and interconnecting electric supply systems under the guidance of some central authority. At this meeting, too, Mr. R. P. Sloan read a paper on fuel economy on the North-East Coast; such economy being due to the splendid efforts of the large interconnected electric power companies in that area. In October was issued a memorandum by the Joint Committee appointed by the Incorporated Municipal Electrical Association and the Incorporated Association of Electrical Power Companies; and it was addressed to electricity suppliers throughout the country. Almost coincident with it was the publication of the interim report of the Committee for the interconnection of Lancashire and Cheshire supply systems, which detailed the proceedings of the Committee since its inception in May. The close of October saw the formation of a Joint Committee of municipal and company representatives with a view to considering a scheme for interconnecting the West Yorkshire electrical undertakings; and a Committee of a similar kind was formed in November to deal with electric supply in the West of Scotland. A little later a Joint Committee, representing municipal and company interests, was formed to deal with the interconnection question in South Wales; in December, a similar Committee was appointed for the West of England area; and later the same procedure was adopted by the supply authorities on the North-East Coast. Then came the Manchester conference of the Lancashire and Cheshire supply authorities, convened by the Board of Trade, and presided over by its Parliamentary Secretary, Mr. G. H. Roberts, M.P.; and in March it was announced that the President of the Board had appointed a Departmental Committee to report on the steps, legislative or otherwise, necessary to ensure an economical supply of electric power for all classes of consumers in the United Kingdom. Recently, too, there has been formed a Provincial Electric Supply Committee, representing some 60 provincial supply companies who are working between 200 and 300 Provisional Orders. A Committee has also been appointed to study the question of interconnecting supply areas in Devon and Cornwall. A conference of West London supply authorities has taken place with a view to establishing a co-operative bulk supply station; and the Incorporated Municipal Electrical Association has formed a Committee on the development of electricity in agricultural areas. The year has indeed been a busy one in moving in the preliminaries to what may result in the electricity supply industry being placed in a more effective trading position.

War Time Experiences of Municipal Concerns.

The managers of most of the municipal electricity supply undertakings now know the best and the worst regarding the working of their undertakings last year. The results are, of course, of a diversified character—the differences arising from the nature of the demand, the cost of fuel delivered, the condition of the fuel, and the efficiency of plant. Other factors to some extent proportionately affect all stations alike. The effect of plant inefficiency on fuel costs is well illustrated by a recent experience at Walsall, where the department is suffering from a general deterioration of plant, by reason of the continuous running of the station on a load considerably above its proper maximum operating capacity. During a few recent weeks, the consumption of coal was 9·12 lbs. per unit generated, against 7·7 lbs. last year. These figures are not the ones that are usually claimed by those who boast that the electricity supply industry is economical and not prodigal in its use of coal—2½ to 3 lbs. being very common figures adopted in calculations by the electrical economists. However, information as to the exact financial issues of the municipal electricity undertakings for last year must await the publication of the accounts. But already it is seen from the additions to local rates, due to electrical deficiencies, and the estimates that are being made for the current financial year, that—except in the more favoured areas—the outcome of the past year of local authority concerns cannot have been generally favourable, despite the increases in price. To a large extent in these cases, the whole of the ratepayers are the real sufferers. Why they should be so is not at all clear, seeing that, if the electricity supply was in the hands of a statutorily controlled company, the users of electricity are the ones who would have to pay the full cost of the service rendered to them, whatever the current conditions. In the case of municipal gas undertakings, how many of them have, during the period of high war costs, had to come upon the rates for assistance? The comparison should be an instructive one for municipal electricity supply departments. A substantial part of the tax upon the ratepayers in support of the electricity undertakings is due in some places to the low-priced contracts entered into for power purposes.

Ratepayers Forced to Help Manufacturers.

Take, as an example—and a bad one—West Ham. The Electrical Engineer there estimates the serious deficiency of £35,500. In November, 1915, the price of current for lighting was increased by 16⅔ p.ct., and for power and heating by 12½ p.ct. From this month, further increases are to be made. Notwithstanding this, there is the heavy estimated deficit. But regarding the further increase of standard rates, the Electrical Engineer states that 72 p.ct. of the output is under contracts for a term of years, and he makes this confession: "This renders it impossible to raise prices to such an extent as would meet the increased cost of production. If rates are raised to such an extent that existing and new business is lost, a permanent injury would be done to the undertaking, whereas the present troubles are only of a temporary character." This will indicate the sensitive and critical basis upon which stand the power charges. However, he recommends a still further increase of 10 p.ct. in the charges. What would happen under similar circumstances in the case of a company? The answer is to be found in the further question, Why should not power consumers pay at any time the full costs of producing their electric power, the same as any patron of any other form of power, or the manufacturer who has his own private power-producing plant? The fact of the matter is, that the West Ham Electricity Department could not, in making its power contracts, have properly protected itself—the estimated deficit of £35,500 proves this—against eventualities; otherwise the power users would have known what to expect in present circumstances, and not have come upon the ratepayers to help them to pay part of the costs of driving their machinery. The injustice of the thing is too palpable to need argument. It strikes us as being nothing less than an impudent form of robbery. No doubt a good many of these West Ham power users are making "excess profits," and paying the excess profits tax, and could well afford to meet the full liability for the running of their plant under war conditions. Nevertheless, the Electricity Department says that the ratepayers must pay part of the cost of supplying electrical power; but no one suggests the payment by the ratepayers of part of the cost of supplying manufacturers with other forms of power. Take Leyton as a further example. At a recent meeting of the District Council, it was stated that the Finance Committee have provided £8589 to meet the deficiency on the undertaking for the half year ending March. This large sum has come out of the pockets of the ratepayers. The estimated deficiency on the undertaking during the current half year is £1368, and for the half year ending March next £6253—together £7621. It is thought that "it would not be fair to ask the ratepayers to provide for the further deficiency in advance." But it looks as though they will have to do so at the close of the year. Poor ratepayers!

Further Increases in Charges.

However, though there are several undertakings under municipal control that are not following out the old axiom that "every tub should stand on its own bottom"—an axiom that perforce has to be complied with in the case of company concerns—it is noticed that a large number, in view of immediate past experiences and the known higher costs that have to be encountered this year, are raising their prices to consumers all round—if not to a sufficient extent in all cases to heating and power users. Flat-rates, maximum demand rates, rateable value rates, and prepayment rates are in many places undergoing revision—alike for lighting, heating, and power. When we come to think of the intermittent use of domestic electric-heaters, which use is controlled by the vagaries of atmospheric temperature without any consideration for the generating station or the demand upon the cables, the charges even on the increased scale are absurd, and an abuse of the principles which the electrical students of the "higher mathematics" used to boast they consistently adopted in framing their tariffs. However, samples from many others as to increases are: For general purposes, Bristol Electricity Department is putting on a further 7½ p.ct., making 22½ p.ct. on the pre-war price basis; and for power, an additional 15 p.ct., making the total increase 45 p.ct. At Ilford the tariff has been revised all along the line. Among the figures it is noticed that the rateable value charge is to be 12½ p.ct. from next June, *plus* ¾d. per unit, while the price for power is to vary from 2¼d. per unit for 500 units and less per quarter to 1¼d. per unit for consumptions up to 10,000 units, and for heating the charge is to be 1½d. per unit. At Accrington, the rateable value tariff is also being increased. At Colne, power is going up from 2½d. to 3d. per unit. Maximum demand rates are to be discontinued at Horsham; and flat-rates are now to be the fashion—6d. for lighting, and for power and heating 2d. All-round increases are taking place at Ipswich—notably for residence lighting and heating on the rateable value tariff, there is to be an increase to 33⅓ p.ct. in place of the present 25 p.ct., and no discount is to be allowed on the fixed charge. Ordinary power supply is to advance from the war time increase of 25 p.ct. to 33⅓ p.ct., and the discount is reduced from 5 to 2½ p.ct. The Lancaster Electricity Committee are putting up their lighting and power rates by a uniform 22 p.ct. Reigate is increasing the charges by 18⅓ p.ct.—making a total war increase of 33⅓ p.ct. The Shoreditch users of electricity for lighting, power, and heating are to pay an extra 5 p.ct.—making a total of 25 p.ct. The occupiers of warehouses, factories, public buildings, and shops at Worcester who are now supplied on the maximum demand system and all consumers on the 4½d. flat-rate are to pay a flat-rate of 5d., and a special increase of 10 p.ct. is to continue to apply to these consumers as well as to those on the rateable value system. Among other increases, the prepayment charges in Birkenhead have gone up (by ¼d. per unit) to 5¼d. inside the borough and 6¼d. outside. It will be seen that some of the undertakings have now increased their charges by one-third more than the pre-war rates; several of the smaller ones have now got quite close, or quite up to, their parliamentary maxima; and the minimum charge in many instances is also being applied.

Metallic Filament Lamp Prices.

What with the reduction in shop lighting, the economy in domestic households, the Summer Time Act, and the inability of many electricity concerns to make extensions, there has no doubt been a great falling-off in the sale of metallic filament lamps, and no increase of price was needed to cause a further decline in demand. Until now there has been no advance in price. But the heavier cost of labour and the greatly increased cost and scarcity of materials are irresistible. The manufacturing firms comprising the Tungsten Lamp Association now announce that the prices of their lamps have been advanced. Those of the 10 to 60 watt size—these are, of course, the vacuum type of lamps—for 100 to 130 volt circuits are now listed at 2s. 6d. instead of 2s. 2d., while 20-watt lamps for 200 to 260 volt supplies cost 3s. 3d., and 30, 40, and 60 watt lamps for this voltage 3s., instead of 2s. 8d. For voltages between 100 and 260, 100-watt lamps cost 5s. Tantalum lamps of the low-voltage type—16 to 50 c.p.—are now priced at 2s., and the high-voltage types from 25 to 50 c.p. at 2s. 6d. This advance cannot be helped; but the electricity supply industry has always recognized that the price of its lamps is a disadvantage. They are not like the incandescent gas-burner, which lasts for years, with the very occasional renewal of the mantle at the expenditure of a few pence, which is a bit different from the 2s. 6d. or 3s. for the domestic sizes of metallic filament electric lamps.

Gas Apparatus for Drying Post-Cards.—There is to be found in the April "Bulletin" of the British Commercial Gas Association an illustrated description of a gas-heated post-card drying apparatus, prepared by the Association's expert in response to an inquiry by a photographer who prints a large number of picture post-cards, and wishes for some means of drying the cards more rapidly than can be done by simple exposure to the atmosphere. The sketch shown is of an oven, the interior of which is fitted with 1-in. angle-iron runners secured to upright supports. The oven can be ventilated either at the top or by means of revolving shutters fitted in the doors.

OPEN-FLAME LIGHTING IN CHICAGO.

In a report issued by the United States Bureau of Standards, it is stated that, as the result of careful inquiry, it was ascertained that, while 40 p.ct. of the consumers in Chicago use some flat-flame burners, only 8 p.ct. of the total sales is so applied. About 14 p.ct. of the consumers—estimated as using less than 4 p.ct. of the gas—employ open flames exclusively.

The illuminating power of the present supply is over 23 candles. If carburetted water gas under the proposed standard of 565 B.Th.U. was substituted, the candle power would be 14 to 15, and all coal gas of similar heating value 7 to 10 candles; while mixed gas would obviously have an intermediate value between these limits. With a 600 B.Th.U. requirement in force, the candle power would be 16 to 18. These figures would, however, be modified by any radical change in manufacturing methods, or the use of a different type of gas oil.

In theory, the utility of an open flame would vary with its lighting power; and a 20-candle gas might be expected to be twice as useful as a 10-candle. On this basis, a 600 B.Th.U. gas would show a decreased value of 20 to 30 p.ct.; a 565 B.Th.U. water gas, 35 to 40 p.ct.; and a coal gas, 60 to 70 p.ct. But the Bureau are not of opinion that these figures should be applied to the 8 p.ct. above mentioned, because in most cases the consumers can readily substitute mantles. The People's Gas Company seek to encourage such replacement, by including in their proposal an offer to supply one mantle gratis to every exclusive user of the open flame, and to instal mantle burners for all customers at cost, or even less. By such substitution, the average consumer would reduce his consumption of gas to a sufficient extent to cover the cost of new burners and reasonable renewals. For these reasons, the Bureau do not attach considerable importance to the loss in luminosity that would follow the proposed new standard, or regard the leaner gas as being very much less useful, on account of the fact that some small portion of it might be used in open-flame burners.

LAYING STEEL MAIN ACROSS A FROZEN RIVER.

The proceedings at the recent meeting of the Wisconsin Gas Association included a paper by Mr. A. F. Davey, describing the laying of a 6-in. steel main across a frozen river, which was carried out at less cost than the laying of similar pipe in the ordinary way.

The district supplied by the Gas Company at Green Bay (Wis.) includes some 30,000 inhabitants, and is divided by the Fox River, which is about 250 yards in width, and has a natural slope on each side, down to a depth of 30 ft. in mid-channel. The gas-works are situated on the east side; and the west side was supplied by one 6-in. low-pressure and one 2-in. high-pressure main, with 4-in. connections on each side. The 6-in. line was put down by a contractor at a cost of about £500, and comprised cast-iron pipe with lead joints. During the last few years the consumption on the west side has increased beyond the capacity of the two mains; so additional 6-in. pipes were laid to the shore on each side, and it was decided to join them by a line of full weight steel pipes, 19·36 lbs. to the foot, coupled-up with Dresser sleeves weighing 140 lbs. each, threaded on the inside with rubber gasket, triangular section, and duck-tipped at each end with twelve ¾-in. bolts to draw them tight. The plan was to have everything ready, and to carry out the work in the winter, when the ice was strong enough to admit of putting the main together on it; the pipe being lowered into position through a channel 15 inches wide to be cut in the ice.

With an ice plough, saw, and picks, the channel was cut; the job being completed in eight hours. The pipe, previously covered with three coats of paint applied hot, was brought out on improvised wooden sleighs, supported in place directly over the trench, tightly screwed-up, and carefully repainted. A drip-pot was attached over the deepest part of the river, from which a 1½-inch suction-pipe extended 100 ft. east and 80 ft. south, to the nearest pier on the adjacent bridge. The line having been all joined-up, the pipe was lowered into place in 100 ft. lengths at a time, by means of four double blocks and tackle that could be attached to the bridge. The entire line was laid in two days. A test revealed a sand-hole in one of the drip-pot fittings, which was repaired *in situ*; and a second test under 30 lbs. showed only a slight loss of pressure in four hours.

Nothing more could be done until the disappearance of the ice in the spring, when it was decided to have the whole length patrolled by a diver, to see that it was all in place. Prolonged pumping at the suction from the drip-pot gave evidence of a leak, and high pressure put on the main located the leak at a sleeve near the drip-box. The diver went down and remedied the defect. Soon after commencing inspection he reported that at one spot the pipe was lying across the hull of an old boat. This obstruction was cut through, to allow the pipe to be carefully lowered to the river bed, when another test showed a third small leak, which was easily repaired. With this exception, the pipe was evenly laid; and the diver's work of inspecting and repairing was completed in three days. When put into use, the main carried high pressure during peak loads with satisfactory results.

The first cost of laying and lowering was less than 8d. per foot run; and the examination and repairing figured out at 6d.—making the total 1s. 1¾d. per foot less than that of laying a 6-in. main in the usual manner on dry land.

Coke-Oven Managers' Association.—At a meeting of the Midland Section, in the Grand Hotel, Sheffield, next Saturday, Mr. P. B. Nicholson, F.C.S., will read a paper entitled "Notes on the Bye-Product Coke-Oven Industry."

THE SOCIETY OF BRITISH GAS INDUSTRIES.

The Annual General Meeting of the Society was held last Tuesday, at the Trocadero Restaurant, Piccadilly Circus, W. The Chairman (Mr. Horace M. Thornton, J.P.) presided, and was supported by a large number of members. Among others attending were Mr. Dugald Clerk, D.Sc., Professor Arthur Smithells, and Mr. Balfour Browne, K.C. (Past-Presidents), the General Manager of the Gas Light and Coke Company (Mr. D. Milne Watson), the President of the Institution of Gas Engineers (Mr. A. E. Broadberry) and the Senior Vice-President (Mr. Samuel Glover). The Junior Vice-President (Mr. Thomas Berridge) was unable to be present. Mr. F. W. Goodenough attended as representing the British Commercial Gas Association. Letters of apology for absence were received from (among others) Sir Hallewell Rogers, Mr. Charles Carpenter, D.Sc., Mr. John Bond, and Mr. John Young. Mr. W. D. Helps was unable to be present owing to the serious illness of his wife, who has unfortunately since died.

Confirmation of Minutes.

The Secretary (Mr. Arthur L. Griffith) read the minutes of the last annual general meeting and the autumn meeting; and they were confirmed.

Annual Report of the Council—The National Gas Council.

The annual report of the Council was taken as read.

It referred in the first place to the loss the Society, in common with the whole gas industry, has suffered by the death of Sir Corbet Woodall, one of the Past-Presidents, "whose unique place in the profession will not easily be filled." The honours which have fallen to the Society's President and Past-Presidents were mentioned. Regarding the National Gas Council, the report stated that the organization of the gas industry, which engaged the attention of the Council for the first half of the year under review, was fully dealt with at the autumn meeting. The National Gas Council of Great Britain and Ireland was formed in October last, for the purpose of promoting, and where necessary defending, the interests of the gas industry as a whole, especially when questions of high importance arise which call for authoritative and co-ordinated action. The Council has already had under consideration, in conjunction with the Society, in addition to other questions, the following important matters: "Classification of Orders for Goods" and "Reservation of Essential Men"—particulars of which have appeared in the Technical Press. The Society made a grant of £100 to the expenses of the National Gas Council. To the funds of the British Commercial Gas Association the Society contributed during the year £2000. The Council thank the members for this support of the Association, and state that several additional firms have become subscribers. They hope that every member "will contribute to the work, which must be for the benefit of all." The Life of Gas-Meters Research Committee is continuing its valuable work. The revision of the Standard Conditions of Contract has been the subject of conferences between a Joint Committee of the Institution and the Society, the result of which has been very satisfactory. The Refractory Materials Joint Committee proceeds with its good work; and the Advisory Committee of the Privy Council has voted the sum of £130 for Scientific and Industrial Research, in addition to the two grants of £50 each made by the Institution and the Society for this purpose. The subject of refractory materials is one of great importance at the present time to the gas industry, as well as to other industries. The Society was represented at a large and influential meeting which was recently organized by the Faraday Society, with Sir Robert Hadfield, F.R.S., in the chair. Mr. Albert Cliff (Chairman of the Fire-Clay Section) contributed one of the papers. The Society, through the Chairman, offered its organization, and any assistance it could render, to Mr. Neville Chamberlain, the Director of National Service, and has already supplied information which has been appreciated. Allusion was also made to the annual report of Prof. J. W. Cobb (Livesey Professor at the University of Leeds) and to other matters regarding which information has already appeared in the "Journal." Before concluding, the Council recorded their thanks to the retiring Chairman, Mr. H. M. Thornton, and announced with pleasure that Sir Robert Hadfield, F.R.S., D.Sc., has accepted the presidency of the Society for the coming year.

The Chairman, in moving the adoption of the report, referred to the loss of Sir Corbet Woodall. He was sure they could not emphasize too much the splendid services he rendered to the gas industry and to their Society during his year of office. He also alluded with sorrow to the death of Mr. Walter Spencer and of Mr. T. E. Priestman. Words of congratulation fell from him to Sir Arthur Duckham on the honour conferred upon him for his splendid work at the Ministry of Munitions. As to the National Gas Council, during the year many meetings were held in connection with this matter; and since the formation of the Council, quite a number of important questions in which the Society were concerned had been dealt with. Good work had been done; and he hoped the establishment of the Council would enable them not only to help themselves in any matter which cropped up for discussion and settlement, but that the industry as a whole, by being united, would be able to show a strong front. He hoped the unity would be more effective in the future than at the present time. The Society would have liked full representation; and he trusted that the future would see their hopes fructify. Having touched upon the reference in the report to national service, he stated that the increase in the annual subscription to five guineas was one that was urgently necessary from the point of view of the Society's interests. Only one or two members considered it unnecessary, while, *per contra*, others had expressed the view that ten guineas would not be too much for a Society of this importance. The members were particularly pleased Sir Robert Hadfield had accepted the office of President; and he (the Chairman) was satisfied he would fill the position with great honour to himself as well as to the Society.

Mr. Fred J. West, in seconding, expressed the hope that before another annual report was issued, the Society would secure right and proper representation on the Executive Committee of the National Gas Council. He did not see how the Society could expect to combine for the welfare of the industry if they were debarred from having proper representation at what was practically the Management Committee of the Council.

The motion was unanimously carried.

Annual Accounts.

Mr. T. A. Braddock (Hon. Treasurer), in moving the adoption of the annual accounts, reminded the members of the excess of expenditure in 1916 over income, amounting to £196. The Council last year were aware of what the position was going to be; and this led to him being asked to bring forward, as a matter of necessity, the question of raising the subscription. The Council were very gratified by the approval of their proposal by the members—approval expressed by the prompt payment of the subscription at the increased amount. This had put the Society on a satisfactory financial basis for the coming year.

Mr. F. J. Gould seconded the motion, which was carried.

Office-Bearers.

The Chairman announced the names of the representatives on the Council of the different sections of the Society. [See list below]. He proceeded to move that Mr. Percy F. Holmes be the new Chairman of the Council. He had been Vice-Chairman during the year that he (Mr. Thornton) had been in the chair; and he was quite satisfied that the members would not wish for any other nomination to be made. They knew Mr. Holmes so well; and they felt satisfied no better selection could be made than him for the position of Chairman. [Hear, hear.] He was sure at the end of the year they would congratulate themselves on having had him in this important position.

Mr. J. W. Broadhead said he had the pleasure last year of seconding the proposition for the election of Mr. Holmes to the vice-chairmanship; but it afforded him even greater pleasure to second his election as Chairman.

The motion was heartily passed.

Mr. Holmes said he was extremely sensible of the great honour conferred upon him by his election as Chairman of the Council. He was conscious of the responsibilities attached to the position, and hoped that at the end of the year it would be realized that what he had done had been to the best of his ability, and that he had proved himself worthy of the confidence the members now bestowed upon him.

Moved by Mr. Holmes, and seconded by Mr. Charles Clare, Mr. Archibald P. Main was unanimously elected Vice-Chairman.

On the proposition of Mr. R. B. Hodgson, seconded by Mr. C. A. Goodall, Mr. T. A. Braddock was reappointed Hon. Treasurer; and the Hon. Secretary (Mr. Charles Clare) was also re-elected, on the motion of Mr. Cyril G. Davis, seconded by Mr. B. B. Waller.

Proposed by Mr. Main, and seconded by Mr. F. C. Tilley, Mr. Thornton was appointed an Elective Member of the Council; and moved by Mr. R. J. Milbourne, seconded by Mr. G. H. Pearson Perry, Mr. J. W. Broadhead and Alderman F. Templer Depree were returned to similar positions.

On the motion of Mr. Albert Cliff, seconded by Mr. W. A. Drake, Messrs. Cash, Stone, & Co. were re-elected Auditors, at the same fee.

With the foregoing elections, the list of officers will be as follows:

List of Officers.

President:

Sir Robert A. Hadfield, F.R.S., D.Sc.

Vice-Presidents:

Dugald Clerk, F.R.S., D.Sc.
Charles Clare.
J. H. Balfour Browne, K.C., D.L.
Colonel Arthur Smithells, F.R.S.
Prof. Harold B. Dixon, Ph.D., F.R.S.
Surgeon-General Sir Alfred Keogh, G.C.B.
The Right Hon. H. E. Duke, K.C., M.P.

Council:

Chairman: Percy F. Holmes, J.P., M.I.Mech.E.
Vice-Chairman: Archibald P. Main.

Fred. J. West	Representing Section	I.
R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S.	" "	II.
C. A. Goodall	" "	III.
Samuel Cutler, Jun., Assoc.M.Inst.C.E.	" "	IV.
F. G. Cockey	" "	V.
Cyril G. Davis	" "	VI.
F. J. Gould	" "	VII.
A. C. Beal	" "	VIII.
John Bilbie, M.I.Mech.E.	" "	IX.
Albert Cliff	" "	X.
George Clark, M.I.Mech.E.	" "	XI.
R. B. Hodgson, M.I.Mech.E.	" "	XII.

Elective Members:

J. W. Broadhead, M.I.Mech.E.
Alderman F. Templer Depree, J.P.
H. M. Thornton, J.P., M.I.Mech.E.

Ex Officio Members:

Charles Clare, *Honorary Secretary.*
T. A. Braddock, *Honorary Treasurer.*
Secretary: Arthur L. Griffith, 46, Queen Victoria Street, E.C. 4.

Alteration of Rules—The Refusal of Candidates or Cancellation of Elections.

Some discussion followed regarding certain proposed alterations of rules.

The Chairman explained that these would bring the rules more into accord with the changes that had taken place in the work of the Society during the last few years, and would make them more in line with present-day circumstances. The most important change was in Rule 11, which gave a much better arrangement in connection with the election of the Sectional Chairmen, and would occasion less confusion than now prevailed. Rule 14 had been considerably altered, so as to make it possible for the Council to be quite satisfied that every member of the Society was a firm of repute. Of course, they had to do this when new members came before the Council for election; but the rule would give them an opportunity at the end of twelve months of making a review should there be circumstances which, whether in war or peace, made it desirable for the Council to take action.

Mr. Thomas Glover (London), in seconding, said he was sorry the revision of the rules was not quite complete. As to Rule 24, it would be noticed that they were deleting the words "by ballot;" but the rule needed further revision. There was a feeling in some quarters that the method of electing representatives of the Society to kindred bodies had not hitherto been done in the most satisfactory way. This matter was still under consideration; and he had no doubt the new Council would arrive at a satisfactory conclusion.

Mr. H. James Yates said he was not criticizing the work of the Council. But in the proposed alterations, the new Rule 5 stated: "Every member shall be subject to re-election annually by the Council at a meeting preceding the annual general meeting." He did not say this was right or wrong; but it seemed to him the members were putting themselves body and soul into the hands of the Council. He could quite understand the suggestions had not been made without considerable care. He knew that very great difficulties had arisen with regard to various members of the Society; and he took it the new words had been inserted for that reason.

The Chairman said the proposals had received the most careful consideration of the Council. He might point out that any member had a right to put forward for consideration any suggestions in any year.

Mr. H. Mitchell thought that, as business men, they ought to be able to frame rules for a Society like this without constant alteration and reprinting.

Alderman Templer Depree pointed out that the last two or three years had not been normal ones; and certain of the rules—more particularly the one Mr. Yates referred to (Rule 5)—would enable the Council to refuse the election of a candidate for membership or cancel the election of a member. Of course, such a step would not be taken without serious consideration. The point was one which might never occur again. It occurred now because the Council in office when the Society was formed, or the Council of any subsequent year prior to 1914, never thought they might have among the members of the Society of British Gas Industries men who could hardly claim to be British. He thought the intention of an alteration of the kind was sufficiently obvious to the members.

Mr. Yates said he merely asked for information, so that they should not commit themselves to the position he had referred to without good reason.

Alderman Depree: It has not been done without good cause.

Mr. Broadhead pointed out that the alteration to Rule 5 necessitated some of the other alterations. In his opinion, they were a big improvement. The last rule to which Mr. Glover called attention would be dealt with by the Council.

The amendments were then passed.

Thanks to the Chairman and Officers.

Mr. Holmes moved a hearty vote of thanks to Mr. Thornton for the work he had done as Chairman of the Council during the past year. Although Mr. West had criticized the part that the Society held on the National Council, he (Mr. Holmes) was sure that but for Mr. Thornton they would not have been even so well represented as they were at the present time. He personally knew of the tremendous amount of work Mr. Thornton had put into this matter; and there had been other work as well. Under his chairmanship every possible courtesy had been shown to every member of the Council.

The applause precluded a seconder.

The Chairman, in acknowledgment, remarked that he was more than repaid. When one had undertaden a task, and had finished it, it was a pleasure to feel that it had given satisfaction to those whom he had tried to serve. With regard to the National Gas Council, this had been the most difficult work of the year. But he did not think he should take any considerable credit for the position the Society held on the Council, because there were seven of the members of the Society to pilot through the negotiations; and though at times he as Chairman had to do things which the others had not to do, at the same time he should like to say how much he was indebted for the guidance of these seven members. Whether they had succeeded sufficiently well and satisfied everyone was another matter. However, they had done their best; and he was satisfied that, as time proceeded, they would get all they desired. To the members and the Council generally, he had nothing but thanks to offer. At all times, they had shown him courtesy, and that same courtesy he knew would be extended to his successor, Mr. Holmes. Proceeding, he proposed a hearty vote of thanks to the Hon. Secretary, the Hon. Treasurer, and the Secretary (Mr. Griffith), who, he said, dealt with the business of the Council and of the Society with great conscientiousness.

Alderman Templer Depree seconded the motion; and it was heartily agreed to.

Mr. Griffith, on behalf of Mr. Clare, Mr. Braddock, and himself, thanked the Chairman and members for their kindly recognition of their services. They had done their best for the Society during the year. It had been a strenuous one, the last part of which he had had no clerk. and so had to be Secretary, clerk, and office boy combined. But, thanks to the energy of the Chairman and Council, they had pulled through all right.

Federation of British Industries.

Mr. H. James Yates said that the *agenda* at this point said, "Any other business." He might therefore say a few words with regard to the Federation of British Industries. He thought there was a real necessity for the Society becoming members of the Federation. Some of the firms, or some of the Associations to which they belonged, might already be members. But to those who were not, he should like to say that the Federation aimed at promoting free communication and discussion between masters and workers, with a view to the establishment of amicable arrangements, so as to insure the avoidance of industrial warfare. It aimed, too, at promoting co-operation among manufacturers and producers, for the development of their commercial and industrial interests. It offered facilities for interchange of views with Governments, Government Departments, public bodies, &c., all over the world, in the interests of industry. It sought to improve existing commercial law, and to control commercial legislation, in the interests of industry; and when they considered the value and importance of these objects, and the fact that already the Federation had a membership which included the largest firms in the country, and represented approximately a capital of two thousand millions, and had actively engaged on its Executive many of the leading captains of industry, the members of the Society would be satisfied, he was sure, that no industrial movement of recent times was more full of promise. The Federation had, from the very first, eschewed everything in the nature of politics; and its membership embraced every shade of political opinion. It had consequently felt itself debarred from expressing any views as a body on a subject which, rightly or wrongly, had become a matter of party politics. They had now got a Committee of the Federation recognized by Dr. Addison, who would consult the Committee on matters arising from the war. They had also two representatives on the Priority Advisory Committee. From this it would be seen the Federation were going to do a great deal of work for various industries of the country. The subscription was £100. When he spoke to Mr. Thornton on the subject of the Society joining the Federation, he said the Society had no funds. He should have imagined that 20s. or 30s. apiece would do it. He did not think the Society of British Gas Industries ought to be outside the Federation. In fact, in his opinion every individual member of the Society ought to be a member of the Federation. It was going to make itself felt, and be one of the most influential bodies in the country.

The Chairman said they were much obliged to Mr. Yates for bringing this matter before the members. It should have the consideration of the Council.

The New President.

The Chairman said he had just received a message from the President, the Right Hon. H. E. Duke, saying that he could not possibly leave the House of Commons. Having in anticipation that Mr. Duke might be detained, he (Mr. Thornton) had asked their Senior Vice-President to undertake the introduction of their new President, Sir Robert Hadfield, F.R.S., D.Sc.

Mr. Dugald Clerk, D.Sc., said he had great pleasure in once again taking the chair at a meeting of the Society. He was their President at the start of the Society; and since then they had had several distinguished Presidents. He was delighted to see present Prof. Arthur Smithells and Mr. Balfour Browne, K.C.—two of the Past-Presidents. The Society had become a great and very successful body. He was exceedingly pleased to find his old friend Sir Robert Hadfield was to be their next President. They could not have chosen a more distinguished man—whether they dealt with Sir Robert from his purely scientific side, from that of his Royal Society work, from that of his investigations, or from that of industry, where he had mixed science and commerce. His efforts had resulted in the discovery of many new alloys which were of great use to humanity. He was glad to see Sir Robert was one of those distinguished individuals who did not crab his own country. They had had far too much decrying of British industry. As Sir Robert had in another place pointed out, the world was far more indebted to Britain in iron and steel investigation than to any other country. Germany came very poorly indeed in all steel matters. They had gone ahead in the manufacture of steel, but the processes were purely British. He had much pleasure in asking Sir Robert to take the chair; and he looked forward to a most delightful year with him in this position.

Sir Robert Hadfield said nothing could have given him greater pleasure than to be inducted into this position by his friend Mr. Dugald Clerk, to whom the Society were greatly indebted for his work for it in its early days. There was no one for whom he (Sir Robert) had greater respect than Mr. Dugald Clerk. His papers had been of the greatest value and importance to the country. He had stood up for the appreciation of British inventions and research. There had been far too much talk as to what the foreigners had done. But if they investigated the leading inventions and researches, it would be found that the enemy—he did not wish to depreciate the great scientific knowledge of the enemy—had not done anything like what had been achieved in this country.

AN ADDRESS FROM THE PRESIDENT.

Proceeding, the President read the following:

Permit me to first say how greatly I appreciate the compliment you have paid me in your electing me to this honourable position of President of the Society of British Gas Industries. As you

know, it has literally been thrust upon me, as I explained before accepting how little time I should be able to spare, on account of much heavy and special war work, which I am sure none of you would wish me to neglect—that is, it must have preference. However, several of your Past-Presidents appealed to me to give a helping hand to this excellent Society; so I consented, for I am always desirous to help the technical man if it is in my power to do so. In my humble opinion, no class of men do more for the welfare of the State.

Another reason was that I felt that while gas engineering had not been my special study, I was coming among friends; for many of your leading members also belong to Institutes, including the Mechanical and Civil Engineers, and to other bodies with which I am connected. I refer, for example, among others, to Messrs. Broadhead, Tilley, Bilbie, Hodgson, West, Cutler, Milbourne, Yates, and to Mr. George Clark. I had also early associations with Messrs. Fletcher, Russell, & Co., for it was with some of this firm's excellent laboratory apparatus in the way of gas-burners and melting furnaces that I remember carrying out experiments when about sixteen years of age at my home laboratory. If anyone wants exercise, let him try, as I did, to melt a few pounds of steel by means of a small Fletcher furnace and blower. To reach a temperature of some 1600° C. and sustain it for the necessary time is not an easy matter. I therefore take this opportunity to thank the Fletcher firm for the help they gave, some thirty-five years ago, in enabling me to turn for the first time my attention in an experimental way to the melting of steel and its wonderful alloys—a branch of work with which I have since been associated.

As explained to your Chairman, Mr. H. M. Thornton, owing to the serious demands upon my time in connection with war work, I feel that it will not be possible to give much in the way of an address—at any rate, for the present. However, I know you will bear with me in this shortcoming, especially as I ventured to tell him, when approached to take your chair, that if it should fall within my power later on it would give me much pleasure to do so when having more time at my disposal.

As to the past work of the Society, it is in this respect enough to say that among your Past-Presidents are those of memorable and noted British fame, and who have been interested in science and technical advancement, including Mr. Dugald Clerk, F.R.S., D.Sc., Sir George Livesey, Mr. J. H. Balfour Browne, K.C., Professor Arthur Smithells, F.R.S., Sir Corbet Woodall, Professor Harold B. Dixon, F.R.S., Sir Alfred Keogh, K.C.B., and others. On your various Committees you have men of such ability as Mr. H. M. Thornton (Chairman of the Council), Alderman F. Templer Depree, Mr. J. W. Broadhead, Mr. Samuel Cutler, jun., Mr. Percy F. Holmes (Vice-Chairman), and Mr. F. J. West. It is also a pleasure to come in touch with your able and hard-working Secretary, Mr. A. L. Griffith, to whom I am already indebted for a good deal of general information regarding the Society. I am sure that he will prove a tower of strength to your present President.

It is also only fair to refer to other leaders of the gas industry proper—that is, to those who cover more than our side of the work. For example, there is Mr. Milne Watson, the Managing-Director of the Gas Light and Coke Company (probably the largest Company in the world); he is also Chairman of the Executive Committee of the National Gas Council, and is one of the leading men in the industry. There is also Mr. Charles Carpenter, D.Sc., who has earned a renowned place in the gas world; also Mr. Harry Jones, the President of the National Gas Council, Mr. Arthur Broadberry, the President of the Institution of Gas Engineers, Mr. F. W. Goodenough, the Chairman of the Executive of the British Commercial Gas Association, and, finally, Sir Hallewell Rogers, who is the President of the British Commercial Gas Association, as well as Chairman of the Gas Committee of Birmingham.

British Gas Industries and the War.

I would like to say a few words with reference to the importance of the Society of British Gas Industries at the present time. There is no section of our community which is rendering more help to fight the war to a successful conclusion. This applies whether in reference to the production of gas for heating and other purposes, or for coal-tar derivatives obtained during the manufacture of gas, furnishing as they do the bases for the high explosives essential in this terrible modern warfare. While I cannot give our home output of these products, it may be interesting to state that in America they have been producing pure or refined benzol at the annual rate of 30 million gallons, pure toluol from six to eight million gallons, phenol from 25 million to 30 million lbs., also 365,000 tons of sulphate of ammonia. Phenol is used to meet the great demand for the manufacture of trinitrophenol or picric acid. A great deal of this phenol and toluol has been shipped abroad—that is, to this country and the Allies—for conversion. Directly and indirectly, therefore, this country has been of benefit to the United States as, because of the demand for these products, she has gradually brought America to the point of being able to help us to meet the enormous requirements. In other words, we have been the means of building-up the United States, and enabled that country to obtain a vast addition to their military resources and industrial preparedness, which we are thankful we can now say will be so usefully applied in the common struggle against barbarism.

Consumption of Gas.

As regards the consumption of gas, it may be of interest to give as an example the fact that at my Company's works in Sheffield we are to-day using at the rate of some 500 million c.ft. per annum. Our works, like many other armament firms, find gas fuel of supreme importance in the manufacture of munitions of all kinds. Therefore, as I have said, the value of the gas industry to the nation at the present time is of immense importance. We are much indebted to the hard-working band of technical men in the different parts of this country who have helped to make possible our work on behalf of the Empire in this her hour of stress and strain.

In contrast with the above, with reference to the use by my Company of gas on a large scale for heating and other metallurgical purposes, it may be interesting to state that we are now also using electric energy at the rate of 50 million units per annum, which, at the present high cost of electric energy, is equivalent to an annual charge of not far short of £150,000. It may be added that the maximum load does not amount to the total capacity of the plant—probably not more than 32 p.ct.—as all portions of the plant are not taking their maximum load at the same time. If this could be done, then the maximum demand, taken as two-thirds of the total capacity of the plant, would raise this load factor to 48 p.ct.

I congratulate you gas engineers upon the splendid work you have done in the past, and I know will continue to do in the future. It is doubtful whether the importance of the work done by gas engineers for munition purposes has been as fully recognized by the Government or by the public as it should have been. Therefore, let me once more say how greatly indebted we are for this national service which you are rendering. Incidentally, I may say that the Gas Company in the North of which I happen to be a Director accomplished the creditable work of producing a weekly output of some 150 million c.ft., or about 7000 million c.ft. per annum. It may be interesting to note that about 10 p.ct. of this was used for gas-engines.

The total gas made in the year before the war (1913) in the United Kingdom has been stated to be 160 million thousand cubic feet, requiring some 17 million tons of coal. The average production of coal gas per ton of coal used was about 11,538 c.ft. In addition to the above, there was a total of about 25 million thousand cubic feet of carburetted water gas produced. I refer to this because an expert—a friend of mine—tells me that this is equivalent to a saving of two million tons of gas coal, reducing thereby the production of gas coke for the year by one-and-a-half million tons. This is an immense help to the gas undertaking, for the reason that there is generally a surplus production of gas coke which is not easily disposed of.

As you will see, the above figures relate to the year 1913. Since then the production has been enormously increased, probably anywhere between 30 and 50 p.ct.; so that the gigantic nature of the industry will be appreciated.

Refractories.

In regard to one branch of work with which I come more in contact, I should like to speak of the excellent services rendered some years ago by this Society, together with the Institution of Gas Engineers, in connection with refractories. In fact, it was your well thought-out specifications, and the able paper by one of the members of the Institution of Gas Engineers, Mr. F. J. Bywater, on "Refractory Materials," which was largely the means of leading, not long ago, to the important gathering of the Faraday Society, of which I happen to be President, when a symposium of most interesting papers was read on this valuable subject. Some 250 to 300 persons attended the meeting. The Society of British Gas Industries is, I am glad to say, now co-operating with an important main Committee organized by the Iron and Steel Institute to deal with this subject; and I cannot but think that important results must follow on the wise attempt of organization and co-ordination in this particular direction. Surely it is much better to have one main organization working for the common good. United in this manner, they are much more powerful, obtain results much more quickly, and generally benefit the various industries more amply than a number of small sections working for their own particular branch.

I would also like to offer hearty congratulations to the Society on the completion of their most useful work relative to the establishment of standard clauses and conditions of contract. The work represented by them must have been very considerable, and ought to be of enormous value to all those concerned, who owe a large debt of gratitude to the Committee who have carried through this important and difficult work.

Patents.

There is one subject to which I should particularly like to refer this afternoon. Why do we not in our Empire try to weld together our common interests more unitedly? Take the question of patents, by means of which, in my opinion, our cousins over the water in the United States have largely built-up their progress. As you know, an American for the small fee of some $35, or about £7, including the final payment, can obtain the magnificent privilege of patent protection for seventeen years from the date of issue of the patent—not merely from the date of application or lodging the specification. This patent monopoly for a new idea, which will indirectly benefit not merely the patentee but the users of the invention, holds good throughout the whole of the fifty-two American States, and covers country representing an area of some three million square miles—in fact, more than this, as I believe American patent protection covers the whole of their Republic, whether North America or elsewhere, and protection can even

be extended to the Philippines on payment of a merely nominal extra fee.

At the present time, within the Empire and within the region where the Union Jack floats, to get full protection requires no less than forty separate patents, the total cost of which, for a much smaller term of years—only fourteen in Great Britain and Ireland—is about £1340. This total charge, what with special Government fees, agents' expenses, patentee's expenses, would probably increase the cost of one patent to something like double this amount. In other words, to sum up, we have a total charge for a patent within the great American Republic of the ridiculously small sum of £7, covering, as I have said, an area of more than 3 million square miles and a population of not far short of 100 million people. Against this, to cover our Empire we have the very heavy figure of probably over £2000—that is, for one patent, including Government fees, also general expenses and charges. It seems impossible to imagine that this country, with its business acumen, should continue such a foolish policy. Incidentally, it may be mentioned that Canada and Australia seem the only sensible members of the British Empire in this respect—Canada granting an eighteen-year patent, and Australia a fourteen-year patent, for the moderate sum of £13.

Is there any wonder, therefore, that with American patents obtainable for about £7, and for 20 p.ct. longer time, as compared with the £1340, or not far short of £2000 to cover all the expenses, paid by a member of this Empire, America goes ahead and develops her material welfare and industry in the way she has done; for without doubt the mainspring of this enormous development of our American cousins has been by their Government's wise encouragement of this system of cheap patents. I am speaking of what I know personally, or I would not lay such emphasis upon this important subject. Take, for example, the great General Electric Company, with their enormous pay-roll of, I believe, between 50,000 and 60,000 people at their various works—it has largely developed its present proud and strong position by the wise employment and encouragement of patents; and the annual balance-sheet generally refers to the amount of money spent in patent protection. This is a very large sum; and yet it is money well expended, as in time it brings literally a return of hundreds—in fact, probably thousands—per cent. for the expenditure and capital so invested. I have only mentioned this one instance; but it is to my personal knowledge of the facts that nearly all big successful corporations in that country have been largely founded upon the basis of important patents, which not only give a monopoly, but enable such corporations to have, at any rate for the time being, an advantage over their competitors. American policy without doubt indirectly benefits in a thousand ways the country concerned. It stimulates invention and encourages the smallest member of its great federation to try and progress in the various arts concerned.

Surely it ought not to be impossible for our Empire to have equal facilities. If we are too short-sighted, then let us accept calmly the fact that we shall not progress as our American cousins have done, because we do not offer these same advantages. But do not put this down to want of knowledge, or to our people being inferior, whether as regards master or man. As one of our Past-Presidents, Mr. Dugald Clerk, D.Sc., has shown, inventive genius and the study of research in this country are not behind, but rather in front of, other countries; but we do not go about trying to develop in the proper and businesslike way which should be done. Obtaining a patent is very much like throwing the proverbial stone into a pond, the ripples from which extend and circulate in a manner which causes no little astonishment. In the same way, it is difficult to say when and where the benefit will end in a successful patent.

We have in this country at the present time large numbers of distinguished representatives from our Dominions, Commonwealths, and other possessions over the Seas—men of position and high rank. May I beg most earnestly that their attention should be called to this important subject, and endeavour made, while they are with us, to in some manner obtain for our citizens of the British Empire exactly the same privilege as is possessed by citizens of the Great Republic. Although those present may not live to see it, I firmly believe that the time will come when it will be possible to obtain one patent for the whole of the Anglo-Saxon speaking race in this terrestrial globe. A better and more excellent way of fighting our enemies with whom we are now at war could not be devised. The claim would not be at all an impracticable one, and with the hearty co-operation, which I believe will be readily obtained, of the Great Republic, our own Dominions, and this country, a step forward in the world's history for advancement and progress in the art of invention would be without doubt obtained, and for the benefit of all the Anglo-Saxon people generally.

Mr. Dugald Clerk remarked that the proposal as to universal patents for the Empire had often been proposed. It would be an admirable thing if it could be done. But it was part of a much larger problem. He had talked with many colonials; and he had come to the conclusion that they were all wishful of having some sort of unity, some sort of unifying influence; but they were all very much afraid of their own individual liberty being interfered with. Their colonial friends all seemed to be affected by the fact that the patent fees brought in some revenue.

Education and Training of Engineering Apprentices.

Mr. H. A. Bennie Gray (Director of Messrs. W. C. Holmes and Co., Ltd.) read a paper on this subject. It was followed by an interesting discussion. Both will be dealt with in the "Journal" next week.

A Vote of Thanks to the Past-President.

Mr. Dugald Clerk next proposed a vote of thanks to the Right Hon. H. E. Duke, the Past-President. He said the members were greatly indebted to him for the interest he had taken in the Society, under the onerous conditions in which he had been working for the State.

Mr. Holmes (as Chairman of the Council) seconded the motion, remarking that the members were exceedingly sorry that it was absolutely impossible for their late President to be with them that afternoon.

The motion was unanimously carried.

This concluded the proceedings; but before separating the members and visitors had tea together.

THE FUTURE OF PUBLIC LIGHTING.

By Thos. Newton.

During the past two-and-a-half years many drastic restrictions of public lighting have been made, in compliance with orders issued under the Defence of the Realm Regulations. Notwithstanding the general inconvenience that has resulted, both individuals and lighting authorities have loyally striven to carry out the manifest intentions of the Home Office; and many anomalies, which were hastily initiated, have hitherto been tolerated simply in order to avoid friction in the prosecution of the war. The absence of alternative suggestions has been solely due to a general desire not to embarrass the Government in the initial stages of the war. But, as these initial stages are now over, the time has probably arrived when the restrictions of public lighting may be reviewed with advantage to all concerned.

The net result of making the various chief constables throughout the length and the breadth of the country responsible for the nature and extent of the public lighting restrictions has been to create an anomalous state of affairs bordering upon utter absurdity. Instead of the subdued and restricted lighting of a given area serving the public convenience, it would almost appear that it reflects only the temperament of the chief constable himself. But, on the whole, the conclusion seems to have been arrived at that darkness is, generally, preferable to light; and this is not the least surprising when it is remembered that this conclusion offers a cheap solution to the non-technical authorities who administer the law.

The pressure-wave control of public lighting offers peculiar advantages at a time like the present; since the lamps may be expeditiously lighted and extinguished at will. Yet these advantages have been practically ignored by those who are entrusted with the power of restricting public lighting; and it is notorious that some districts, wherein the lamps may be instantaneously extinguished, have been more harshly dealt with than other neighbouring districts, wherein the work of extinguishing the lamps occupies the best part of an hour. Thus are the advantages of a system lost on those who are unfitted to appreciate them.

The drastic restriction of public lighting—amounting practically to its abolition—is likely to produce consequences of a far-reaching character, unless a watchful eye be kept on its subsequent development; and this is a matter of some importance both to the general public and to the many gas undertakings throughout the country. A lowering of the standard of public lighting efficiency is, of course, inevitable for the duration of the war; but care and vigilance will both be required to prevent wrong conclusions being drawn as a consequence. It took years to educate the public up to the standard of efficiency that was achieved at the time when war was declared; and there is real danger lest the labour involved be to some extent dissipated. Partially as a result of the campaign of economy, and partially as a result of drastic lighting restrictions now in force, questions are already being asked as to whether it is really necessary, or advisable, to revert (when the times comes) to the former standard of efficiency. These and similar questions only go to show how soon the whole perspective may be lost, and how necessary it is to guard against hasty and ill-considered suggestions.

There are many valid reasons why the efficiency standard should not be lowered more than is absolutely necessary, just as there are many valid reasons why the lowered standard should be raised to at least its former efficiency as soon as is practicable. The great point to guard against is any stereotyping of the restricted standard; and to this end it is to be hoped that no hasty decisions will be recorded. The subject is probably worth consideration in the immediate future by the National Gas Council. Certainly, the issues involved will have to be faced at no far-distant date, when the time for consideration may not be so opportune.

Yorkshire Junior Gas Association.—There was a meeting of the Association at the Leeds University on Saturday afternoon, when Mr. A. Edwards (Chief Chemist to the Leeds Corporation Gas Department) read a paper on "Gas Washing, Analysis of Products, Application to the Control of Stills." What he had to say was listened to with much interest by those present; but unfortunately we are compelled to hold over until next week our report of the proceedings, on account of the inability of the author to send along in time for this issue certain diagrams essential to the proper understanding of the paper.

THE UNIFICATION OF SCREW THREADS OF PIPES, ETC., FOR GAS AND OTHER FLUIDS.

A PROJECT FOR HARMONIZING DECIMAL AND BRITISH STANDARDS.

In its issue of March 20 the "Journal des Usines à Gaz" publishes a report on a question which for more than fifteen years has, from time to time, been brought to the notice of gas engineers—viz., an international agreement as to the threads for screwed joints.

The initiative was taken in 1900 by the Société Technique du Gaz, by the appointment of a Committee, which, however, did not meet until 1908 [see "JOURNAL," Vol. CII., June 30, 1908, p. 924]. It was then decided that its inquiry should include pipes for steam, air, and water, as well as for gas; and four subsequent meetings of the Committee were held—the last in August, 1913, when international agreement had been come to on the chief matters, and a Sub-Committee had been elected to clear-up the remaining points, and to present its conclusions at a last meeting, which was to have been held in November, 1914. The Sub-Committee met on July 20 and 21, 1914, and made recommendations which should have been finally confirmed four months later. Though all further proceedings have naturally been suspended, the Chairman of the Sub-Committee, M. Charles Marre, of the Paris firm of Bariquand-Marre, has at length presented to the Société d'Encouragement pour l'Industrie his report on matters which were the subject of unanimous agreement.

The following is an abridged translation of the report which M. Marre has issued, apparently on his own responsibility, while stating the composition of the Sub-Committee—viz., Mr. Laurence V. Benet (American Society of Mechanical Engineers), M. De Boor (Swiss Union of Machine Makers), M. Defays (S.A. D'Escart et Meuse), Messrs. Howard Krause and Leslie Robertson (British Engineering Standards Committee), Mr. W. H. Lindley (German Gas and Water Works Association), and Herr Molien (Mannesmann Tube Works, Düsseldorf).

The recommendations of the Committee relate to both cylindrical and conical threads, and are embodied in a table [B] which has been drawn up in a simplified form [A] at the suggestion of a Committee of the Société d'Encouragement, to which M. Marre first presented his report in the absence of the previous body. The simplification consists in the omission of the figures (0·85L) for the lengths of the threads in cylindrical tubes. It is suggested that the length L (for taper threads) should serve as well as the smaller length. Also data for taper threads of 1 : 32 taper are not included in the table, on the ground that 1 : 16 taper threads are to be employed whenever possible—those of 1 : 32 being suitable only for specially thin tubes. With this preliminary comment, the table and M. Marre's explanatory notes on it may be given.

In defining the two descriptions of thread—cylindrical and taper—it is pointed out that the latter have the same section of thread as the former, but the threads are traced on a cone, and are regarded as generated by a triangle placed so that its height is perpendicular to the generatrix of the cone in a diametral plane. The surfaces, the whole of which form a taper thread, will thus follow a kind of helix traced on a cone. Therefore, the diameters of the threads are not equal at any point, since these diameters, as those of cross sections of the cone which forms the base of the thread, vary constantly from one point to another.

In practice, the same unions are used for joining the pipes of a system whether the pipes end in cylindrical male threads or have

TABLE B.—*Screw Threads in Tubes.*

Dimensions of cylindrical and 1 : 16 taper threads adopted by the Sub-Committee, July 20 and 21, 1914.

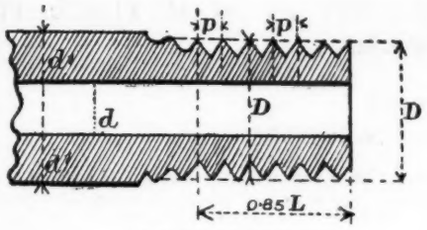
Internal Diameters, Nominal D.		Gauge Diameter. D.	Number of Threads in 127 mm.	Length of Threaded Taper at End of Pipe L.	1/16 Taper.	
					Distance, l between Gauge Diameter and End of Pipe.	Permissible Variation in Position of Gauge Diameter.
Inches.	mm.	mm.		mm.	mm.	± mm.
1.	2.	3.	4.	5.	6.	7.
1/8	3	9·8	140	10·0	4·5	1
1/4	4	11·0	90	10·5	4·5	1
1/4	6	13·4	,,	11·5	5·0	1
3/8	10	16·8	,,	13·0	6·0	1
1/2	13	21·0	70	14·5	6·5	1
5/8	15	23·0	,,	16·0	7·0	1·5
3/4	19	26·4	,,	17·5	8·5	1·5
7/8	22	30·2	,,	19·0	9·5	1·5
1	25	33·2	55	22·0	10·0	1·5
1 1/8	29	38·0	,,	22·0	11·0	2
1 1/4	32	42·0	,,	23·5	12·0	2
1 1/2	38	47·8	,,	24·0	13·0	2
1 3/4	44	53·8	,,	27·5	14·5	2·5
2	50	59·6	,,	29·0	16·0	2·5
2 1/4	57	65·8	,,	30·5	17·0	3
2 1/2	60	69·4	,,	31·0	17·5	3
2 7/16	62	72·6	,,	31·5	17·5	3
2 1/2	64	75·2	,,	32·0	18·0	3
2 3/4	70	81·6	,,	33·5	19·0	3
3	76	88·4	,,	35·0	20·0	3·5
3 1/4	83	94·0	,,	36·5	21·5	3·5
3 1/2	90	101·0	,,	38·0	22·5	4
3 3/4	95	106·6	,,	39·5	23·5	4
4	100	113·6	,,	41·0	25·0	4
4 1/2	113	125·8	,,	43·0	27·0	4·5
5	125	138·4	,,	45·0	29·0	5
5 1/2	138	151·2	,,	47·0	30·5	5
6	150	163·8	,,	49·0	32·0	5 5
7	175	189·2	40	54·0	34·5	5·5
8	200	214·6	,,	57·0	37·0	6
9	225	240·0	,,	60·0	38 5	6·5
10	250	265·4	,,	62·0	40·0	6·5
11	275	290·8	,,	64 0	41·5	7
12	300	316·2	,,	66·0	43·0	7
13	325	347·4	,,	68·0	44·5	7·5
14	350	372·8	,,	70·0	46·0	7·5
15	375	398·2	,,	72·0	47·5	8
16	400	423·6	,,	74·0	49·0	8
17	425	449·0	,,	76·0	50·5	8·5
18	450	474·4	,,	78·0	52·0	8·5
20	500	525·2	,,	82·0	55·0	9

In the threaded length L, all threads should be complete, except that two may be incomplete as regards the lowest part of the cut.
The gauge diameter D is the diameter of the cylindrical thread over the limits of its cross section.

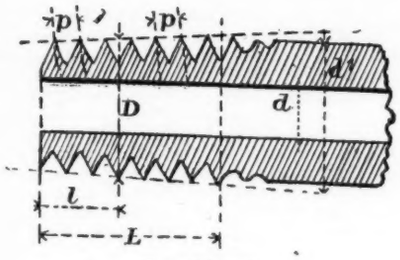
TABLE A.—*Proposed Dimensions of Screw Threads on Tubes. Cylindrical Threads and 1 : 16 Taper Threads.*

Gauge Diameter. D.	Number of Threads per 127 mm.	Length of Threaded Taper at end of Pipe. L.	Distance between Gauge Diameter and end of Pipe.	Permissible Variation Either Way in Position of Gauge Diameter.	Gauge Diameter. D.	Number of Threads per 127 mm.	Length of Threaded Taper at end of Pipe L.	Distance between Gauge Diameter and end of Pipe.	Permissible Variation Either Way in Position of Gauge Diameter.
mm.		mm.	mm.	mm.	mm.		mm.	mm.	mm.
9·8	140	10·0	4·5	1	94·0	55	36·5	21·5	3·5
11·0	90	10·5	4·5	1	101·0	,,	38·0	22·5	4
13·4	,,	11·5	5 0	1	106·6	,,	39·5	23·5	4
16·8	,,	13·0	6·0	1	113·6	,,	41·0	25·0	4
21·0	70	14·5	6·5	1	125·8	,,	43·0	27·0	4·5
23·0	,,	16·0	7·0	1·5	138·4	,,	45·0	29·0	5
26·4	,,	17·5	8·5	1·5	151·2	,,	47·0	30·5	5
30·2	,,	19·0	9·5	1·5	163·8	,,	49·0	32·0	5·5
33·2	55	22·0	10·0	1·5	189·2	40	54·0	34·5	5·5
38·0	,,	22·0	11·0	2	214·6	,,	57·0	37·0	6
42·0	,,	23·5	12·0	2	240·0	,,	60·0	38·5	6·5
47·8	,,	24·0	13·0	2	265·4	,,	62·0	40·0	6·5
53 8	,,	27·5	14·5	2·5	290·8	,,	64·0	41·5	7
59·6	,,	29·0	16·0	2·5	316·2	,,	66·0	43·0	7
65·8	,,	30·5	17·0	3	347·4	,,	68·0	44·5	7·5
69·4	,,	31·0	17·5	3	372·8	,,	70·0	46·0	7·5
72·6	,,	31·5	17·5	3	398·2	,,	72·0	47·5	8
75·2	,,	32·0	18·0	3	423·6	,,	74·0	49·0	8
81·6	,,	33·5	19·0	3	449·0	,,	76·0	50·5	8·5
88·4	,,	35·0	20 0	3·5	474·4	,,	78·0	52·0	8·5
					525·2	,,	82·0	55·0	9

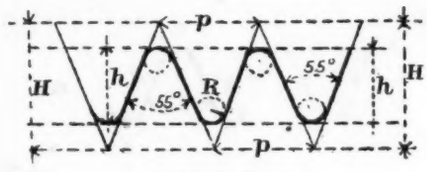
In the threaded length L, all threads should be complete, except that two may be incomplete as regards the lowest part of the cut. In taper threads his length is a minimum.



Cylindrical Thread.



Taper Thread.



Section of Thread.

d = Nominal internal diameter of tube.
d_1 = Approximate external diameter of tube.
L = Length of threaded portion.
D = Gauge diameter of thread.
l = Distance of gauge diameter from end of tube.
55° = Angle of thread.
p = Pitch of thread.
h = Depth of thread ($0{\cdot}64\ p$).
R = Radius of rounded end of thread.

The section of the thread is a truncated isosceles triangle of base p, angle at apex 55°, and of depth $h = 0{\cdot}64\ p$.

The parts cut away from the apex and base of the imaginary triangle are equal. The radius R of the rounded portion of the thread is that of a circumference touching the sides of the triangle and its line of truncation.

The pitch p is measured in the axial plane of the tube on the generating line of the cylinder in the case of cylindrical threads and on the generatrix of the cone in the case of taper threads.

The pitch is designated by the number of threads in a length of 127 mm.—*i.e.*, 5 inches very nearly.

Two degrees of taper are adopted: 1 : 16 and 1 : 32. A taper of 1 : 16 is one in which there is 1 mm. difference in diameter in a length of 16 mm. measured along the axis of the cone.

A taper of 1 : 32 is that in which there is 1 mm. difference of diameter in a length of 32 mm. similarly measured.

---

taper threads. As a rule, these unions are short lengths of pipe of larger diameter than the pipes to be joined, and are tapped on the inside, always with a cylindrical female thread. It is, therefore, necessary when specifying taper male threads on pipes to define the exact position of the cross section of the threaded taper which corresponds with the diameter of the cylindrical thread used for the union. It is this diameter which is designated as the gauge diameter of a taper thread.

In order to define a cylindrical thread, or equally the gauge of a taper thread, it is necessary to determine exactly the cross-section—*i.e.*, the geometrical surface which is a maximum for male and a minimum for female threads, such as of unions. Into this determination three elements enter, and require to figure in a specification as such: (1) Form of thread; (2) true diameter, D, of threaded cylinder; (3) pitch of thread.

As regards the form of the thread, its section is that of part of an isosceles triangle of base equal to the pitch and 55° angle at the apex. The parts removed [troncatures] from this complete (imaginary) triangle are about one-sixth at the base and one-sixth at the top of the threads; each thread being rounded-off by an arc of a circumference tangent to the sides of the triangle and to the line of truncation. This proposed shape conforms very closely to that of the Whitworth threads. It was the desire of the Committee to bring its proposals as closely as possible into correspondence with the Whitworth system, in view of the firm establishment of this system in England, and its widespread use throughout the world, even in France, in numerous gas plants put down in the first instance by British engineers. In the case of threaded pipes, the advantage of having a thread of stout and well-rounded section is emphasized on account of the readiness with which tight joints (even metal to metal) are then made. The Committee has also sought to fix exact data which are easily carried out on the metric system and may be calculated decimally. On this point, the Committee is unanimously of opinion that the proposed unification can be popularized only if decimal and metric bases are chosen which can be simplified as much as possible. To this end, the height of the truncated thread is defined as 0·64 of the pitch by neglecting the other decimal figures which would result from the rigid application of the Whitworth system by taking the "troncature" at one-sixth.

The diameter, D, adopted for the threads on pipes depends on the thickness of the pipe, which again will depend on the thickness of the pipe supplying the fluid and on the pressure.

In dealing with the pitch of threads the Committee has been guided by the experience of the French naval constructors as to the greater strength of joints with fine threads, and also by the fact that British engineers have long adopted a series of only four pitches for threads of diameter from 11 to 500 mm. But on the representation of certain French and American members of the Committee, a finer thread for tubes of less than 10 mm. internal diameter has been added, on the ground of its usefulness in certain industries; and the complete series is thus in conformity in this respect with those in countries where the Whitworth standard, with or without modification, is employed, for threads of one or other of five pitches, from the smallest to the largest.

In seeking to bring metric threads into line with Whitworth, the inch has been taken as 25·4 mm. (an error of only 0·0000223 mm.), and a base for standard threads has been chosen of 5 in. (127 mm.), from which pitches of 140, 90, 70, 55, and 40 threads per 127 mm. have been derived. On this basis, the pitch is easily calculated in both metric and British units; while the threads so obtained are interchangeable to a degree more than sufficient in the tube industry.

The Committee is of opinion that the adoption of its proposals would make scarcely any change in the trade custom in British countries. In other countries, machine tools (chiefly lathes) fitted for cutting metric threads could be converted by the addition to a train of gear-wheels of one of 127 teeth, for the production of the proposed threads without further disturbance of machine-shop practice or plant.

M. Marre, in concluding his report, makes special acknowledgment of the help rendered in the course of the inquiry by the Société Technique, in the persons particularly of its President, M. Boutan, and of M. Coze.

Electrolysis of Cast-Iron Pipes.—As the result of investigations into the causes of the deterioration of cast iron under various conditions, Professor Bauer and Mr. Wetzel have come to the conclusion that cast-iron pipes in the presence of moisture "in dropforming fluid form" will deteriorate whether or not they are exposed to the action of stray currents, or galvanic action, however, will considerably accelerate decomposition—especially if the cast iron takes the place of the anode. In the case of grey cast-iron, the decomposition always follows the follicles of graphite, and gradually spreads away from these. When pipes are resting in moist soil, and the products of decomposition are not removed, the work of destruction is naturally more apparent than in situations where such products are washed away.

Institution of Petroleum Technologists.—Referring to the very much greater part which petroleum is likely to play in the future history of the nation than it has done in the past, Mr. Charles Greenway (the new President) said, in his address, he thought it was a matter for which they had reason to be profoundly grateful that Sir Boverton Redwood should have conceived the idea of founding the Institution, and that his labours in the cause of petroleum technology should have been most ably and energetically seconded during the past year by Prof. Cadman, as President. Mr. Greenway, speaking from his commercial and financial experience of the industry, went on to say that it had long been his feeling that the experts engaged in the technical work of oil companies should be more closely associated with their administration than is unfortunately the case in most of the large British companies at the present time.

Immediate Problems in the Gas Industry.—The Presidential Address delivered by Mr. F. L. Cross (Vice-President and General Manager of the Madison Gas and Electric Company) to the Wisconsin Gas Association comprised a consideration of the problems requiring to be immediately faced. Among these, he alluded to the abnormal cost of fuel and materials, and the fact that in some of the larger communities skilled or unskilled labour is almost unobtainable at any price. The competition between municipal authorities, contractors, and companies, he said, has led to the payment of extravagant wages, attended with no increase in working efficiency, but accentuated by continual demand for shorter hours. Taxation, too, looms-up in more serious proportions than ever. Perhaps they had been dilatory in availing themselves of the great potential power of the State Universities, in the development of the industry; and some of them knew, from personal experience, the valuable assistance that was received in other States in this direction. He recommended that some definite steps should be taken for the founding of a Gas Association Fellowship in the Wisconsin University, in order that greater interest in the industry might be fostered, and an alliance of unquestionable value be entered into.

THE APPLICATION OF COAL GAS TO INDUSTRY IN WAR TIME: ITS NATIONAL IMPORTANCE.

By Horace M. Thornton, M.I.Mech.E.

[A Paper read before the Royal Society of Arts, April 18.]

When I read my last paper before the Society, "The Uses of Coal Gas for Industrial Purposes" (now over two years ago), I suggested that we were witnessing the dawn of a new era in industrial heating. On that occasion illustrations were given, by lantern-slides, of about seventy applications of coal gas to our largest national industries—representative of a very much greater number known to be in operation. In spite of these already numerous uses, industrial gas was merely then in its early development; and the realization of the universality of its service was only growing gradually upon the manufacturers of this country. To-day he would be a bold man, indeed, who would define the limits of its penetration.

The extent to which British industries, and therefore the nation at large, are under tribute to this great servant of the twentieth century is very much clearer now than it was even two brief years ago. It is probable that two years of war have taught us, as a nation, more than two decades of peace. Much that we have been forced to learn, we would willingly forget; but if there are to be found any valuable products from this time of outpouring of life and treasure, one of the chief will surely be the great progressive movements which, under the stress of war-time conditions, have characterized our foremost industries. It has been so with industrial gas. Uses hitherto unknown have been discovered; uses hitherto regarded as being impossible have been proved successful. Town gas, of which we thought we had known the full story for many years, and the decline in the use of which had often been prophesied—that common and ordinary lighting, cooking, and heating agent, delivered to us so simply through pipes into our homes—has proved to be much more potent, and far more serviceable, than our familiarity with it allowed us to conceive.

To-day I wish to take up the story where I left it on the occasion of the last paper in March, 1915, and to give some account of the progress that has been made in the interval. At that time I gave, among details of many industries, particulars of a few of the uses of gas that were in operation for the production of armaments and munitions of war generally. To-day, so extensive are the uses of gas for these purposes, that they provide more than sufficient material for this paper. Indeed, it is necessary, if your patience is not to be unduly tried, to restrict ourselves in the first place to a consideration of the uses of the gas-furnace in the engineering world—omitting the wide application of this fuel to the glass, cotton, cloth, hat, boot, confectionery, food, and many other trades, with which I dealt in my last paper, and which during the last two years have found still further scope for the utilization of gas. I also desire to devote some time to the modern movement in regard to "welfare work" in factories, and the part gas plays in this important subject.

Some Reasons for the Popularity of the Gas-Furnace.

Before passing to the examples I wish to give, and the illustrations I have to show, it will be of interest to trace some of the reasons which have led to the result I have described. Numerous and complex problems faced the engineers and manufacturers of this country anxious to respond to the call for "munitions, more munitions, and still more munitions." In many cases it was the problem of an immediate and enormous increase in normal production; in others (in many others), it was the problem of converting factories from the production of peace-time commodities to the turning-out in vast quantities of war-time necessities.

Whatever the circumstances, the demand was for increased productivity, multiplied manyfold on ordinary output; and this was required to be achieved with the utmost speed, and in face of an already heavy withdrawal of labour for military requirements. Under the stress of this need of maximum quantity with minimum labour at maximum speed, many a manufacturer requiring a heat-treatment process—and heat is a well-nigh universal necessity in manufacture—sought and found the solution to his problem in the use of gas.

Let us look a little more closely into the facts as presented to industry when the demand for munitions of all kinds became insistent, and we shall see the part that gas for production purposes has played.

1.—The volume of labour was reduced, and, as events have proved, the manufacturer had to be prepared to face a still further decline. The gas-furnace economized valuable labour, as no stoking was required; no fuel had to be transported or stored; no clinkering had to be done; no ashes had to be removed; very much less time was lost waiting for the furnace to heat-up.

2.—Existing factories had to be utilized to the full extent of their capabilities; for while we admire the gigantic enterprises of the Ministry of Munitions in erecting new factories, these took some time to build, and a great accession to our materials of war was required immediately. Here the gas-furnace—compact, self-contained, and mobile—showed to advantage. It gave economy in space, and made possible an increase in output per unit of factory area. No smoke-stack was required. The choice for the position of the furnace was practically unlimited—enabling it to be brought into close proximity to the machine worker. No space was required for the storage of fuel or ashes. The capital expenditure in many cases was lower than for coal-furnaces. No special structural alterations to the factories were required. No foundations were necessary. No provision had to be made for the extraction of smoke, soot, or dust from the workshop.

3.—The most vital need was for an instantaneous, and yet abnormal, acceleration in production. The gas-furnace, with its easy, accurate control of temperatures and its constancy of action, speeded-up the output, increasing the number of operations—annealing, hardening, melting, &c.—per working day by, in many cases, 100 p.ct. over crude heating methods. Its fuel was always available, and at a constant calorific value. With reasonable care there was no spoilt work, and no "rejects" owing to irregular heating. The time required for each operation could be definitely ascertained, and the work could be performed at a uniform speed, enabling the works manager to depend on a constant supply of his heat-treated materials for the other departments of the factory.

Annealing Tool Steel Bars in an Oven Furnace, 22 ft. 6 in. long.

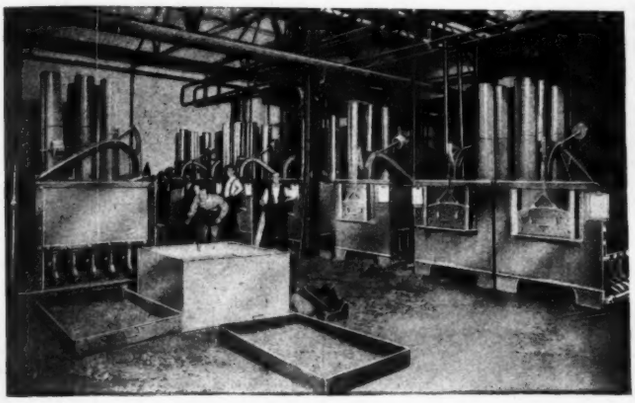
Gas-Furnaces for the Production of Munitions.

By the aid of a series of exceedingly well executed lantern slides Mr. Thornton proceeded to examine many of the actual uses to which gas-furnaces have been put during the last two eventful years. Some of the photographs shown are reproduced. He then dealt with the use of gas in the manufacture of tools of all kinds—cutters, reamers, lathes and planing tools, broaches, &c.—which has expanded enormously since the war began. The careful heating of high-speed steel to critical temperatures so necessary for good results is, it was pointed out, accomplished perfectly with gas. He passed to the treatment of the non-ferrous metals, aluminium, &c.—the melting of brass, copper, aluminium, cupro-nickel, &c., being accomplished by gas in ever-increasing quantities for the manufacture of rifle and machine-gun cartridge cases, shell cartridge cases, driving bands, fuses, &c. Then he showed a slide of the silver and bronze melting house at the Royal Mint, where gaseous fuel has proved its economy over coke in respect of output, cost of fuel, cost of graphite goods, and cost of labour. After dealing with a large number of other uses of gas in manufacturing operations on a large scale, he exhibited a slide of one of the erecting shops in a large works engaged in the manufacture of gas-furnaces. Accuracy and control of temperature being always required of gas-furnaces, Mr. Thornton pointed out that it is essential for the manufacturer to know exactly what

his furnaces can do with different materials; and gas is equally of use in the test-room with its blower, pyrometer outfit, &c.

The lecturer proceeded: I do not venture to claim that this recital of the uses of gas in the last two years for the production of munitions is anything like complete. Some of the more familiar have been omitted owing to exigencies of time; while it is certain that very many applications of gas are being practised which have not come under one's own observation.

The extent of the increase in the use of gas for industrial purposes during the past two years can be best demonstrated by the consumption recorded by the gas-works in industrial towns. By



"Richmond" Patent Furnaces Installed in One of the Largest Hardening Shops in the Country.

the kindness of the respective gas engineers, I have been furnished with the following remarkable figures, showing the consumption for the last complete year of peace and for the year ended Dec. 31 last:

Gas Consumption for Manufacturing and Power Purposes in Eight Industrial Towns.

	District.	Annual Consumption for Industrial Purposes.		Percentage Increase.
		1913.	1916.	
		Cubic Feet.	Cubic Feet.	
A	Midlands . . .	110,707,000	174,167,000	57
B	,, . . .	327,047,700	420,490,600	28
C	Yorkshire . . .	10,760,800	21,583,700	100
D	North-East . . .	187,473,300	321,841,800	72
E	,, . . .	650,000,000	1,650,000,000	154
*F	Midlands . . .	1,901,392,000	3,500,000,000	84
*G	,, . . .	65,882,200	140,000,000	112
*H	North	720,032,300	1,155,461,810	64

* These figures are to March, 1913, and (estimated) to March, 1917, in each case.

Coming to individual factories, by the courtesy of the engineer of one of the largest gas-works in Suburban London, I am able to give the following figures of consumptions; and the increases cannot fail to arrest attention:

Gas Consumption of Nine Typical Factories on War Work.

	1913.	1916.	Percentage Increase.
A	3,618,300	15,579,000	330
B	3,631,400	19,407,200	434
C	5,202,800	9,845,100	89
D	4,944,900	14,836,900	200
E	1,187,600	40,546,000	3,314
F	818,500	8,314,900	923
G	23,390,400	52,043,500	122
*H	—	111,407,200	—
*I	—	40,000,000	—

* New factories, recently opened.

Fascinating as this subject is, and full of interest to all who love to mark the stages in the development of industries, I must not linger, as I wish to call attention to other and equally important uses of gas in industry.

Welfare Work in Factories.

In the period of reconstruction and readjustment that will follow the war, many problems will call for solution. Numerous views have already been expressed; books, almost without number, have been published; and nearly every day brings a fresh contribution. It would not be relevant to say anything on the subject to-day, except in respect of two points on which I think we shall all be agreed—viz., the desirability of improved relations between capital and labour, and the supreme need in the country's interest for continuing the high level of productivity which the last two years have witnessed.

One of the outstanding and most remarkable features of this generative time has been the almost phenomenal growth of what is known as "Welfare Work" in factories. Such marvellous success has attended its expansion that there is no doubt of its substantial contribution to the solution of the two problems I have mentioned.

The Ministry of Munitions, under the inspiration of Mr. Lloyd George, early recognized its value, and appointed a Special Committee "to consider and advise on questions of industrial fatigue, hours of labour, and other matters affecting the personal health and physical efficiency of workers in munition factories and workshops." This Committee has issued memoranda, to the number of fourteen, of a most practical character; and every possible guidance and assistance has been provided for employers who desire to improve the working conditions of their men and women, and to secure their highest efficiency, and consequently their full productivity for the nation's need.

Welfare work is not altogether a new thing in this country, nor in America. Successful attempts—some on a scale as elaborate as the best we know to-day—were made many years ago; but it is only recently it has attained great prominence. Its benefits to the employer were seen to be as pronounced as to the employee. Care for the health and well-being of the worker created a greater productivity, and enabled the enhanced output to be maintained over a period of almost unlimited extent.

The Industrial Canteen.

With these things we are to-day concerned in our consideration of the national importance of gas in war time; and probably ranking primarily in importance and pivotal to all the other schemes is the question of feeding the worker. This introduces the industrial canteen.

To quote one of the memoranda issued by the "Health of Munition Workers' Committee" previously referred to: "There is now an overwhelming body of experience which proves that productive output in regard to quality, amount, and speed is largely dependent on the physical efficiency and health of the worker. In its turn such physical fitness is dependent on nutrition."

Ordinarily there are many obstacles to workers securing this adequate nutrition. Many (probably most) workers must have their meals away from home; many have to work on night shifts. The common method formerly in vogue was for the worker to bring from home food prepared for eating. This necessarily limited the choice of food. It was cold, and likely to be stale. When the weather was warm, or the workshop was hot, it readily underwent deterioration. An advance on this crude plan was for the employer to provide facilities for the warming-up of food brought from home. In some districts, there are public-houses and dining-rooms available outside the works. But even in these cases the accommodation is not always adequate, and frequently the conditions are far from satisfactory. To meet the problem, therefore, employers have established workpeople's dining-rooms or industrial canteens in or near the factory itself. Canteens, as in other forms of welfare work, naturally range from the simple provision of a separate room in which the workers may eat their own food, to an elaborate scheme of a complete dining-room. We are chiefly concerned to-day with the kitchen, the equipment of which with the most suitable apparatus is a matter of the utmost importance.

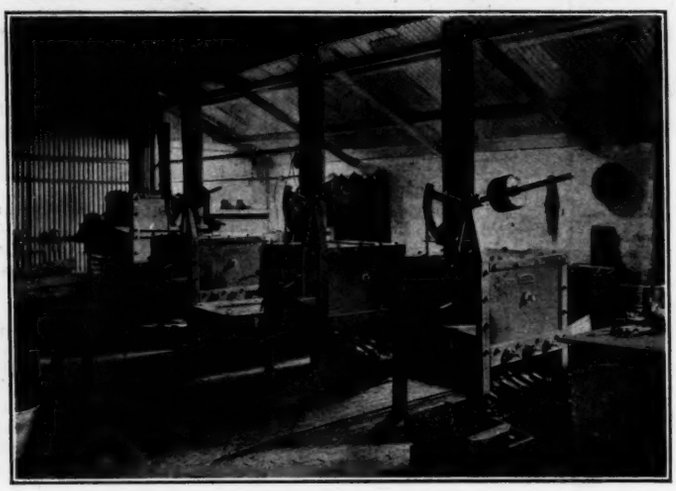
Food must be well cooked, or complaints will naturally soon be voiced. The cooking must economize, not waste the food, since the most stringent care is necessary to secure the utmost value

"Richmond" Patent Furnaces Installed in One of the Largest Hardening Shops in the Country.

owing to the comparatively low prices that must be charged, and particularly now our food supplies are so costly and need to be so carefully conserved. The cost for fuel must be as low as possible; and the whole work must be performed with a minimum of labour. It was doubtless these considerations that led the Committee on the Health of Munition Workers to state: "Where gas in sufficient quantity is available, gas cooking is usually preferred, on account of cleanliness, efficiency, and saving of labour."

Examples of Works' Kitchens.

The lecturer commenced with illustrations of two modest installations for supplying meals in small factories. The first showed

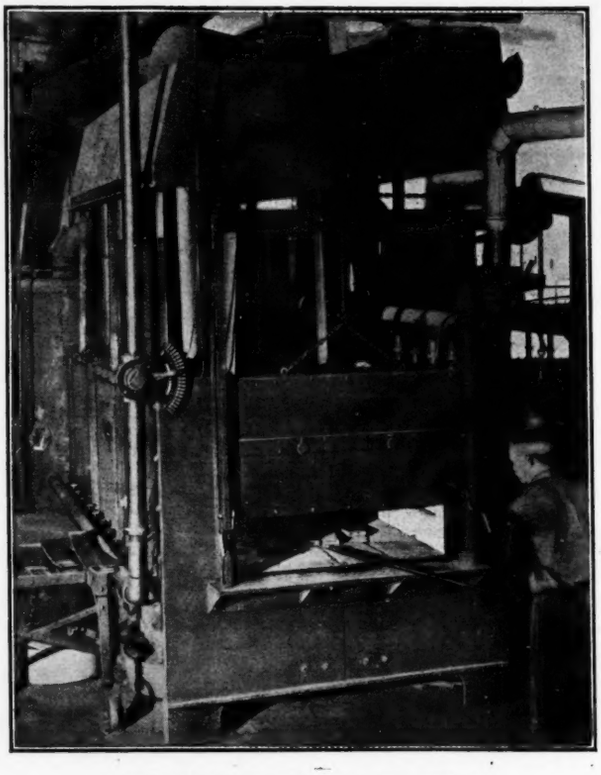


Re-heating Cycle and Motor-Cycle Component Parts.

a works' kitchen to provide meals for about sixty hands—quite a simple equipment, but adequate for the requirements, and doubtless a great boon to the workers. Then there was an installation a little more elaborate, catering for about one hundred workers daily. Still on the ascending scale, there was shown a kitchen for about two hundred and fifty people, with apparatus much larger and more varied. Particulars of many other larger establishments were given.

Gas Apparatus for Tea and Coffee Making.

The provision of coffee, tea, and cocoa for workers is at times associated with, and sometimes separated from, general canteen work. Also in factories where, for various reasons, it has been decided not to instal a complete canteen, it is often a general practice to supply at least tea, cocoa, hot milk, &c. The Health of Munitions Workers' Committee strongly recommend the practice; and in works carrying on certain industrial processes entailing any special risk of disease, the Ministry of Munitions stipulate that this provision shall be made. In this connection a picture was shown of a large gas apparatus in one factory for providing instantaneous supplies of boiling water. The large storage cylinder here used, combined with a powerful boiler, enables 500 pots of tea to be made in a few minutes.



Oven Furnace for Annealing Cupro-Nickel.

Concluding this branch of his lecture, Mr. Thornton said: I would like to have continued and told you of the uses of gas in many other departments of "Welfare Work"—such, for example, as the important subject of good illumination, which is adequately provided by the use of incandescent burners with gas under pressure; also of the provision of washing facilities and baths where gas-heated circulators provide the necessary supplies; of the "Rest Room" heated by hygienic gas-fires; and the "First Aid" post with its gas-heated geyser for hot water, &c. Time, however, prohibits detailed references to these subjects.

He resumed: These, then, are some of the ways (representative of numberless others) in which gas has served the community in war time; and I am sure you will agree with me it is no mean record that it has produced. And yet the story is not complete.

National Importance of the Bye-Products.

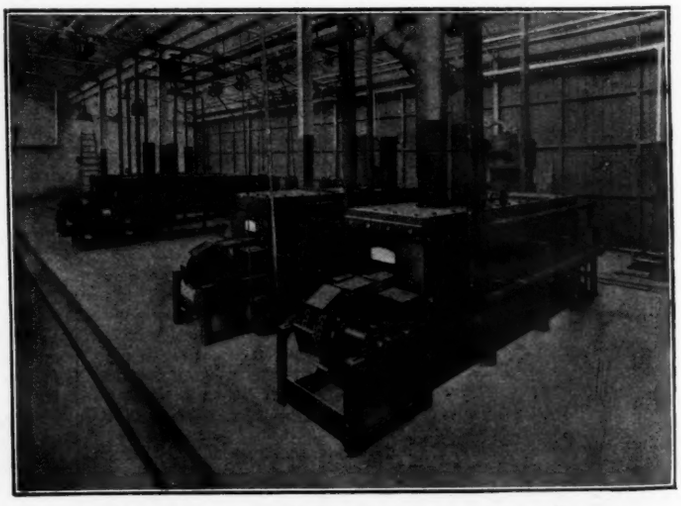
Apart from its importance as a lighting, heating, and cooking fuel, as I have endeavoured to describe to-day, it possesses other and not less valuable properties of great worth, but essential in time of war. I refer, of course, to the bye-products—coke, tar, sulphate of ammonia, creosote, carbolic and cresylic acids, benzene, and toluene—certain of which contribute to the making of explosives, such as trinitrotoluol. Of these last, which in this war are vital to our preservation as a nation, the gas industry is providing a worthy proportion of the output in this country. Reluctantly, I must withhold the actual figures; but the full story of the patriotic endeavours of the gas undertakings in their ready response to the request of the High Explosives Department at the Ministry of Munitions will be told one day, when the war is over.

Further, there has to be considered the conservation of one of our greatest assets, our stock of unmined coal. Prof. Brame, the successor of Prof. Vivian B. Lewes in the Chair of Chemistry at the Royal Naval College, Greenwich, estimates the coal reserves as follows:

	Millions of Tons.
United Kingdom	186,153
Germany	415,794
Russia	59,079
France	16,207
Belgium	10,803

He further deduces, from our present rate of coa production, that we are exhausting our supplies at a far higher rate, proportionate to our stock, than our nearest commercial rivals. The Royal Commission on Coal as far back as 1871 contemplated the time when we, whose industrial greatness has largely been founded on our abundant and easily-obtained coal supplies, shall actually have become importers of coal. The statistics issued by the International Geological Congress in 1913 revealed that Great Britain only possesses about one-fortieth and our whole Empire only one-fourth of the world's estimated coal reserves; while the United States, likely to be our chief competitor in the near future, holds more than half. The most economical use of our remaining supplies is, therefore, a very practical and urgent question; and to aid in the solution the gas industry offers an important contribution. We welcome the formation of the Board of Fuel Research, appointed by a Committee of the Privy Council, and presided over by our Chairman of to-day, Sir George T. Beilby, LL.D., F.R.S., F.I.C., F.C.S.

We are now concerned with the fuel consumption of the factories of the country. It has been estimated that some 70 million tons of coal are burnt per annum for industrial purposes. Now I do not suggest that the whole



Four Belt-Driven Conveyor Furnaces for Heating Brass Billets.

of this coal could be displaced by gas; but a large part of it undoubtedly could be. With what result? First, this huge total of coal consumed in factories, if carbonized in the retorts of gas-works, might be expected to produce about 840,000 million c.ft. of gas; and, as I have already endeavoured to show, this immense volume of thermal energy utilized for industrial heating processes would produce much enhanced results, compared with those to be obtained if the coal were burnt crudely.

With coal there is a large amount of waste of heat units in effecting its combustion, and in driving off those volatile constituents which are useless where high temperatures and pure incandescence are required and must be obtained. There is also waste of heat units up the chimney shaft, and through stand-by requirements. There is waste of heat units every time a fire is recharged, until once more favourable working conditions of the fire are realized.

A "Richmond" Kitchen for Providing Meals for 600 Employees.

Value of the Bye-Products.

Then there are the bye-products obtained. Instead of these ascending the chimney and "wasting their foulness on the city air," if scientifically treated on the lines of modern practice, they are preserved for the service of man. The coal burnt annually in our factories, would, if carbonized, give us, in addition to the thermal value of the immense volume of gas mentioned (say) 35 million tons of a smokeless fuel (coke) of high calorific value, and suitable for innumerable uses. Since the war started, a large advance has been made in its application to steam-raising and road traction.

Then the amount of coal mentioned would give approximately 700 million gallons of tar, the worth of which will be obvious. One of its many uses, of recent development, is for road making; and the new roads in the military areas in France have used thousands upon thousands of barrels of tar from English gas-works. As one of its minor uses, I might mention that I was told recently that tar was the most suitable lubricant for steel-pressing work. Contact with the hot steel splits the tar into its free oils, and it is giving great satisfaction, and is much cheaper than other lubricants.

Another valuable bye-product of gas manufacture is sulphate of ammonia. From the 70 million tons of coal before referred to might be extracted about 825,000 tons of this excellent fertilizer. Its worth has been emphasized by the Board of Agriculture in their endeavours to cultivate the home production of foods.

The increase in motor traffic, and the consequent passing of the horse, have largely deprived our farmers of a source of material of good manurial value. These are, however, days of intensive cultivation—days when the largest and most valuable product per acre of land is required; and artificial fertilizers are therefore more than ever increasingly necessary. Nitrate of soda is a very valuable fertilizer in respect primarily of its quick action under favourable conditions; but with heavy rains it suffers the disadvantage that it is quickly washed-out of the soil. It is imported; and it therefore helps to weigh in the balance against our exports. Sulphate of ammonia is in normal times cheaper per unit of nitrogen than nitrate of soda, and much more so now. To destroy so rich a fertilizer by the crude use of coal is emphatically not to the national advantage.

I have already referred briefly to the explosives derived from coal tar, to the motor spirit (benzol) that is recovered, and of which it is estimated 200 million gallons are lost per annum through the consumption of raw coal in our factories. I might continue and remind you of the dye, drug, chemical, photographic, and perfume industries that are all of them dependent, more or less, on the derivatives of coal-tar distillation.

Possibilities for the Future.

An absorbing story, truly, is this wonderful recovery of such priceless commodities from the secondary products of coal-gas manufacture. What an impetus it provides for legislation to reduce the amount of coal burned in a raw state! So vast are the possibilities that it is quite within the range of reason that gas may become the bye-product and the present bye-products the primary ones. The value of the products for which coal would be carbonized and tar distilled may, with the revelations of time and science, become so great as to enable the gas to be sold at an exceptionally low figure—so low that competition of any other fuel, including raw coal, would be impossible. The present position is that less than a fifth of the coal extracted from our mines is treated to recover bye-products. This gives an idea of the field still waiting investigation and development.

In addition to the direct loss in the bye-products as I have tried to explain, there is the loss to the nation by the employment of the labour, horse, and other vehicles necessary for the distribution of coal, which, of course, contributes to the wear and tear of our roads. All of this will be detrimental to our productive capacity in the strenuous years ahead; and, therefore, the transfer of every possible pound of the crudely-used coal to a more scientific and economic usage is an imperative necessity.

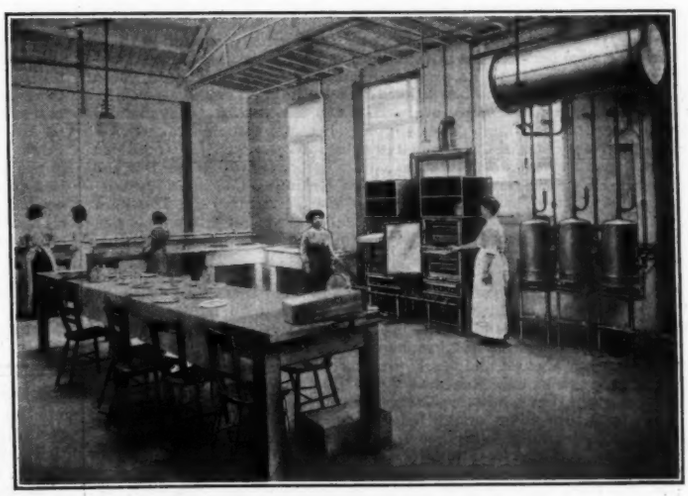
So far, I have again to-day endeavoured to tell some part of the story of the service of gas in war time—inadequately, I fear; for the colossal nature of the subject renders it impossible for one individual to deal fully and justly with the whole. But if I may assume for the moment the *rôle* of prophet, and you ask me as to the prospects of the future, I can only reply that in my considered judgment what has already been accomplished is but a small earnest of what may be expected. The great market for gas seems to me to stretch almost illimitably into every sphere of human life and activity. New functions for its use and new methods of application are being discovered daily; appliances for its consumption are being perfected, and mechanical handicaps are being removed; and its supremacy above all fuels is being gradually but surely recognized.

In the realm of domestic cooking, heating, and water-heating its sway is becoming universal. Possessing the advantages we have seen this afternoon, with its record of service in the hour of the nation's greatest need—with the knowledge of its value gained in a time of unprecedented stress and strain—can we doubt that in time, shorter in period perhaps than is at present apparent, gas will be equally supreme in the greater world of industry?

In conclusion, I would express my thanks to many engineering friends who have responded to my request for information on the subjects treated in this paper, and to the Richmond Gas Stove and Meter Company, Ltd., of Warrington, for providing details of their gas-furnaces.

Discussion.

The Chairman (Sir George T. Beilby, LL.D., F.R.S., F.I.C., F.C.S., Chairman of the Fuel Research Board) remarked, before the paper, that Mr. Thornton was not a stranger to the Society of Arts. Two years ago he delivered a lecture before the Society; and in it he reached a high standard of interest both in the treatment of the subject and in the importance of the illustrations. He believed that on the present occasion he would not only maintain his former standard, but would even raise it to a higher level. At the close of the paper, Sir George



Another View of the Kitchen Providing Meals for 600 Persons.

said it was a great satisfaction to him that the prediction he ventured to make at the beginning of the meeting had been fulfilled. The last part of the paper had rather partaken of the character of a prophecy. It had also partaken to some extent of the character of the utterances of those lecturers and professors who told them that they were wasting their resources; and that they had only to wave the magic wand, and they would realize all the wasted products, as well as great wealth and prosperity for the nation. Had they not had the first part of Mr. Thornton's paper, he should have made some criticism upon this attitude. The lesson that Mr. Thornton had most prominently brought before them—the lesson at least that he (Sir George) was inclined to draw from the paper, was that this great reform could only be brought about by the kind of work that Mr. Thornton and his colleagues had been doing patiently and diligently for many years past. Had the country not had people like Mr. Thornton who had been quietly before the war developing the use of gas in these remarkable ways, there would have been no one to give the country the help that they had done in the production of armaments, &c., when the war first broke out. The lesson that he wished to impress was that none of these reforms could be brought about unless they had workers patiently sitting down to the different problems to be solved, and not rising until they had, by specific foresight, by trial and error, by careful experiment, really mastered the particular bit of the subject set before them. He (the Chairman) deprecated the large and airy treatment of the wonderful changes that were taking place in the country. He was delighted that he could make this criticism in Mr. Thornton's presence, because, if they could get a large number of Mr. Thorntons among them, the grand reform would go on much more quickly than they could otherwise hope for. Even five years ago, if those who were accustomed to the use of coal gas in the laboratory and in small furnaces had been told that, in this short space of time, we should have had furnaces 22 ft. long heating large steel bars, they would not have credited it. Even the chemist, who believed immensely in his laboratory furnace and blow-pipe, would have been staggered had he been told that it would be economical to heat-up tons of steel with gas at 2s. per 1000 cubic feet. The work that Mr. Thornton and his colleagues had done in this respect undoubtedly gave great promise for the future; but he (the Chairman) felt that, while he was sure gas consumption would go on and largely increase, it would be necessary they should have a greater production of cheap and, if necessary, poorer fuel gas.

Sir Robert Hadfield, F.R.S., joined in the appreciation by Sir George Beilby of the valuable paper. It was, he said, by giving attention to the small things to which he had been devoting his life that Mr. Thornton had made possible what a few years ago would have been thought impossible. His (Sir Robert's) own firm in the North used large quantities of gas for war work. At the present time their consumption was about 500 million c.ft. per annum. This would give some idea of the scale on which they were making use of gaseous fuel. It was an immense help in time of war. There were no ashes and no scoria to be taken away. Gas-furnaces relieved them of a great amount of labour; and, as Mr. Thornton had stated, it enabled them largely to increase the output of munitions. Speaking of a visit he paid to Pittsburg some years ago, he said that they had there natural gas of an even higher calorific value than coal gas, which the manufacturers were able to get at 5d. per 1000 c.ft., or less in very large quantities. This was another reason why in this country they must put their shoulders to the wheel, and try to improve methods by which they could get still cheaper gas. He was going to make a remark with which some present might not agree; but surely this was the time when one ought to speak out. It was of the greatest possible importance for their industrial supremacy that they should have encourage improved and cheaper methods of production. One of these methods should be how to get a still cheaper supply of gas. If their American competitors could get gas for 5d. per 1000 c.ft., it was obvious the manufacturers in this country would be at a disadvantage if they paid four to five times as much. The gas companies were charging far too high a price. It was true they were under Acts of Parliament, and paid nice fat dividends. He was a gas director himself. [Laughter.] But still he thought they ought to try to set out and meet the country's needs. In regard to using gas for the heat treatment of steel, there was no more delicate alloy in the world than steel. If high carbon steel was heated to 729° C. and quenched, it would not harden, yet by going only 3° C. higher, the small difference would give a dead-hard product. This showed how important it was they should have absolute control over the heating temperatures. With coal gas they could better control the furnace. With a mixture of ordinary furnace gas and air, they often had whirling zones and admixtures of air and gas, and thus the steel became also unevenly heated. By means of even heating, such as obtained with properly made coal gas, they could get a much more uniform and better hardened product. The more carefully steel was heated, the more sure were they of the quality. Any method that would enable them to accomplish heating with more certainty and regularity was of the greatest possible importance. He would like to ask Mr. Thornton the question as to whether he was aware that the late Sir Henry Bessemer devoted great attention to the study of high-pressure melting furnaces. He (Sir Robert) thought Mr. Thornton would find a great future if he would study the proper mixtures of gas and air at high pressures—not only 20 lbs., but three or four times this amount.

Mr. F. W. Goodenough, having endorsed what the Chairman and Sir Robert Hadfield had said with regard to the paper, remarked that he was sure they could congratulate themselves upon having a paper by one who had made himself a master of the subject of the industrial uses of gas, and having as Chairman one who was practically interested in the subject always, and at the present time especially because of his recent appointment as Chairman of the Board of Fuel Research. He had no doubt that what Sir George Beilby had heard that afternoon would strengthen him in the belief that coal gas had a great future before it industrially, as well as in its sphere as a domestic fuel. What struck one from the facts put forward by Mr. Thornton was that, in the factory as in the home, it was becoming more and more true that the same work could be done at equal or less cost by gas in comparison with crude coal, and yet, after the gas had been used, there remained from its production a residue of good fuel—half the quantity of the original fuel in the form of coke—and other bye-products. This seemed to point the way to a great conservation of the fuel resources of the country in the future. Sir Robert Hadfield had referred to the question of cheaper gas and to the "fat" dividends of gas companies. But he (Mr. Goodenough) would point out that, so far as a large part of the gas industry was concerned, the higher the price of gas the lower the dividends. By the Statutes that governed the principal company gas undertakings in this country, the price of gas could not be raised unless the dividends were reduced. The gas industry had therefore a great inducement to work economically, both for itself and for its consumers. He did not think there could be much the matter with the price of gas at Sheffield compared with the United States. The average price of gas in the United States was substantially higher than the price of gas in this country. And he did not think there was much the matter with the price of gas in this country when they knew that Sir Robert Hadfield's firm recently secured an order from the United States for shells to be supplied at some future date. Upon this fact, they could congratulate both Sir Robert and the Sheffield United Gas Company. [Laughter.]

Mr. James Swinburne observed that natural gas was even more plentiful in America in the past. When in Pittsburg in 1887, he asked the price of gas per 1000 c.ft.; and his informant said he did not know—he just rented a 5-inch pipe. [Laughter.] Was it, he asked, really the fault of the gas companies that gas was at the present price? He felt the gas companies were very much hampered by law. For instance, one factory might be taking gas by millions of cubic feet; and if this had to pay its share of the total charges in proportion to the consumption, not to the cost of supply, the factory would have to pay more than its fair share, compared with the consumer who used but little gas. There was no doubt that gas was very much hampered by this sort of legislation. The splendid development there had been in the use of gas made him wonder whether it could not be taken further, so as to make gas still more economical than at present. High pressures had been mentioned. One pound of gas, with the right amount of air, gave a certain amount of heat; but a higher pressure would not give more heat. The only advantage of higher pressure was that the heat was applied more quickly. Whatever was being ordinarily heated, the heat was being carried away wastefully. But the higher pressures were a means of getting the heat applied quicker; so that, with the same loss per minute by radiation and convection, the work was heated better. Was it not possible to go farther in the design of gas-stoves and other gas-consuming devices? If they could have gas-ovens perfectly insulated, they would need to burn a smaller quantity of gas and air, which would be consumed at a higher temperature. They ought to strive to get as little waste of heat as possible. At the present time, coal gas was shockingly wasted. A perfect furnace would have no loss by conduction through its walls; and the chimney would carry off gases at the temperature of the work. If the work could be fed through continuously, the hot flame would be playing on the hottest parts, and the burnt gases would pass along so as to leave the furnace at the temperature of the coldest part of the charge. No doubt the lecturer had considered such matters; and it would be very interesting if he would tell the meeting about them. Perhaps after the war rush further advances might be made in the economy of gas-furnaces.

Mr. Thornton, in replying to the discussion, said he should like to thank the Chairman for the very kind words he used in opening the discussion. It was sufficient reward for any trouble and any effort he had put forth in the preparation of the paper to have such high appreciation from Sir George. Sir Robert Hadfield raised the question of the price of gas, and Mr. Goodenough dealt with that; and he had not the least donbt that Sir Robert was thoroughly convinced by the argument. [Laughter.] Mr. Goodenough was far more able than he (Mr. Thornton) was to defend gas-interests; and there was no one who had done more during the last few years for the progress of the industry. Mr. Swinburne had raised some interesting points as to the possibility of more economy in regard to gas-furnaces; and he thought he might have added, of any gas apparatus made to-day. He (Mr. Thornton) had not the slightest doubt that the great progress which had been made in efficiency and construction the last few years—and it had been exceedingly great—would be continued. In fact, he questioned very much whether they could recognize the apparatus of ten years ago compared with present-day productions. It had been a wonderful history of progress; and he felt quite satisfied, had it not been for war time, that the laboratory workers of all the manufacturers of gas apparatus (who were to-day reduced in numbers) would have made greater strides than had been possible in the direction of economizing gaseous fuel. On the other hand, the war had given them a tremendous impetus in regard to the necessities of the time and the future; so that, as soon as it was possible, they would again engage in the examination of fresh problems that had arisen, and carry out the necessary experiments towards further progress in the direction named by Mr. Swinburne. He was satisfied that, in ten years' time, they would be found to have achieved quite as much advance as they had in the past ten years. Sir Robert Hadfield's references to Sir Henry Bessemer and the subject of melting furnaces, he (Mr. Thornton) had not had experience in the direction mentioned, although the melting of all metal had received, and was receiving, constant investigation. His previous remarks with regard to laboratory investigations would assure Sir Robert that the subject would receive careful consideration. He thanked all the speakers for the kind remarks they had made upon the paper.

Proposed by the Chairman, a very hearty vote of thanks was passed to Mr. Thornton.

North of England Gas Managers' Association.—The annual meeting of the Association will be held in the Gas Offices, Newcastle-upon-Tyne, on Saturday, the 5th prox., under the presidency of Mr. William Hardie. There are two papers to be read—one by Mr. H. E. Bloor, B.Sc., B.Eng., of York, on "Some War-Time Alterations of Works, and the other by Mr. T. M. Waller, of Durham City, on "Organization of the Gas Industry."

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Stourbridge Refractories Company, Ltd.

On the invitation of the Stourbridge Refractories Company, Ltd., a visit was made by about forty members of the Association on Saturday to the works at Shut End, Pensnett, near Dudley. The party were received by Mr. F. Astbury (Managing Director) and Mr. E. Cookson (a member of the Board). Mr. Astbury apologized for the absence of Sir Arthur Duckham (the Chairman of the Company) and Mr. Fred Vale, whose engagements had necessitated their presence elsewhere. Besides Mr. Astbury and Mr. Cookson, Messrs. Robert and Ernest Vale, W. Bennett, and Stewart George assisted in conducting the members round the works. The fact that the works had been kept running specially for the occasion, added to the interesting nature of the tour of inspection.

The following notes had been prepared in advance of the visit.

DESCRIPTION OF WORKS.

The Stourbridge Refractories Company, Ltd., are manufacturers of vertical, horizontal, and segmental retorts, special blocks for generator and regenerative settings and producers, and for water-gas plants. The works have been designed to manufacture about 160 tons of fire-clay goods per day; but only half has been laid down at present. The available ground is about 10 acres, flanked by a mineral line and canal. Two brick-works sidings have been provided, which connect-up over the mineral line with the Great Western Railway Company. Fire-clay and coal are obtained from several pits adjoining the brick-works.

The main building, 272 ft. × 92 ft., comprises mill, kilns, and drying chambers, while one-half the area is covered, forming an upper floor. The mill contains two sets of perforated revolving clay mills, with bucket elevator screens and return shoots for large material, together with a vertical mixing pan, pug mill, and horizontal brick-making machine; the whole forming a complete unit. Power is supplied by two electric motors, each of 140 B.H.P. (one only in use) driving on to one main shaft from which all the machines are driven.

In the portion of the mill covered by the upper floor is a power-driven semi-plastic brick press, with a few small hand-power presses. The greater part of this floor space will be occupied in making retort and special large bricks, for which purpose arrangements have been made for heating the floor by means of waste heat from the drying chambers. Part of the upper floor is occupied by brick makers, and part also by pattern makers and joiners' shops.

The kiln is of the continuous type, with sixteen chambers, each 19 ft. × 16 ft. 9 in. × 10 ft. 6 in., with capacity sufficient to take one day's output of the mill. The kiln chambers are in two parallel rows of eight, connected at the ends by underground flues; the main waste-gas flue running down between the rows to a stack 180 ft. high, situated outside the building. Each chamber has four (two each side) small gas producers; the necessary secondary air for combustion being heated-up by passing through the three or four chambers which had been previously fired. The waste gases from the chamber being fired are passed through two or three chambers in advance before going into the main flue. The producers can be fired by gas from outside producers, if desired, later on.

The drying chambers, which are situated over the kilns, are heated by the residue of heat left in the kiln chambers when cooling. A network of narrow-gauge rails and turntables has been laid down, for easy manipulation of the wagons which convey the bricks to the drying chambers.

Besides the bricks and blocks already mentioned, the Company make special carborundum bricks, designed to withstand, not only high temperatures, but also a heavy load; and insulating bricks for various purposes. The members were impressed by the very thorough manner in which the regenerative principle is made use of in the heating of the kilns; the contrast between this portion of the plant and the old type of kiln being evidence of the great advance made during recent years in this particular direction. The guides spared no pains in explaining thoroughly the plant and methods of work.

Subsequently, the members adjourned to the offices, where tea was provided; and having regard to the general conditions existing at the present time, this attention was highly appreciated. After tea,

The PRESIDENT (Mr. G. C. Pearson) proposed a hearty vote of thanks to the Company for their invitation to make the visit, to Messrs. Astbury and Cookson and the other gentlemen who had assisted in showing the members round the works, and for the hospitality so kindly afforded. He said the visit had been most interesting and instructive. The manufacture of fire-clay material was of vital importance to the gas industry; and it was essential that all should have a good knowledge of the general processes involved. They could understand more intimately the reason for delay in the supply of fire-clay goods, after what they had been seeing that afternoon. The Refractory Materials Committee were doing valuable work for the gas industry in their efforts to improve the quality of refractory materials generally. It would be a very great help if sections of retorts could be standardized, so that orders might be promptly met by supplies from stock. No doubt much would be done in this matter after the war. He congratulated the Directors of the Company on the very efficient way in which the various processes they had seen at work were carried out, and also on the application of scientific principles in the control of the plant. When the whole plant was completed, he had no doubt it would be one of the finest in the country.

Mr. R. G. MARSH (Senior Vice-President) seconded the vote of thanks, which was accorded enthusiastically.

Mr. COOKSON, responding, said the Company had been only too pleased to have the members there, and were glad that they had found the visit interesting and instructive. The work had been carried on under great difficulties. They were just at a critical period when the war began; but the members would be able to judge what they had accomplished since then, thanks chiefly to the efforts of their Managing Director, Mr. Astbury. Their aim was to produce fire-clay material second to none in the country; and they claimed that already they could make goods which the Stourbridge firms could not touch. They would be able to double the output in the future, when the extensions, which the advent of the war had prevented them from proceeding with, had been carried out. They regarded the gas industry as their best friends.

Mr. ASTBURY also said they had had a very hard task—especially since the commencement of the war. It was only in November, 1916, that the Ministry of Munitions had seen fit to place the manufacture of fire-clay material on the certified list of trades, which, in their case, practically amounted to "shutting the stable door after the horse had gone." They had to do their best with the labour at their disposal, and would remind those who were inclined to grumble at delays of one kind or another that the whole of the blame did not rest with them. After the war they hoped to achieve such an output that there would be no ground for complaints as to delay.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Annual General Meeting.

The Annual General Meeting of the Association was held at the Heriot-Watt College, Edinburgh, last Saturday—the PRESIDENT, Mr. J. J. Scott in the chair.

The PRESIDENT delivered the following

PRESIDENTIAL ADDRESS.

In the course of some opening remarks he expressed the opinion that, if the Association wished to go forward in the march of progress, they must consider unity of action with kindred Associations The Junior Associations were already doing a great service to the young men of the industry; but this service could be improved in many ways by combined action. In view of the altered circumstances that would present themselves after the war, it seemed to him imperative that a reorganization of the Association's work must take place. Proceeding to deal on a pre-war basis with the subject of country district street lighting, he said:

Street lighting is valuable to a gas company, both for its monetary worth and its assistance as an advertising agent; and it should be obtained and maintained against all competitors. When an extension of gas supply to an outlying district is under consideration, the question is asked: "How much public lighting will be required?" In certain cases, this may be the deciding factor as to whether the extension should be proceeded with. It certainly strengthens the scheme when it can be relied on.

It has been part of my duty to arrange, and carry out, the work in connection with the formation of three lighting areas under the control of the Fife County Council within the area supplied by the Kennoway and Largo Gas Companies, also to supervise the lighting of these districts in the execution of contracts entered into by my Directors. I intend to deal with these districts as the basis of my remarks, and will give a short *résumé* of the preliminary work in the formation of a lighting area.

A requisition, signed by at least twelve ratepayers residing in the area, submitted to the District Committee of the County Council, craving that the streets may be lighted, or a similar suggestion made from the Parish Council, generally opens up the subject for consideration, with the result that a special lighting district is formed; the Council being constituted a Committee to take charge of the district and receive estimates which are submitted to the District Committee, with their recommendations. In this matter the gas manager can do a lot with the exercise of judicious tact by way of assisting the Parish Council. Generally, the area formed is the same as that prescribed for drainage and cleansing, with a view to obtaining simplicity in administration and for imposing the special lighting assessment.

There is, I think, a maximum assessment of 6d. in the pound—*i.e.*, 3d. an owner and 3d. an occupier—for public lighting, and the rateable value of the area, together with the total of the other assessments, are to some extent the deciding factors as to the amount of lighting assessment which can be imposed; and it in some cases decides the amount of lighting which can be obtained. For instance, the lighting assessment in each of the districts under my charge is as follows:

No. 1	District	3d.	in the pound	supplies	80 lamps.
No. 2	,,	2¾d.	,,	,,	45 ,,
No. 3	,,	5d.	,,	,,	31 ,,

In arriving at the amount of assessment to be made, the Committee, having obtained an offer for the complete erection of the

lamps at so much per lamp, and having estimated the number of lamps necessary for the district, arrive at the capital cost of the installation. The County Council advances them money on loan for (say) 25 to 30 years, at a rate of interest of about 3½ p.ct., which, with the repayment of the loan, constitutes the capital or standing charges. Offers for the lighting and maintenance are then considered; and this cost, with the standing charges added, is the amount of money required annually from the rates. In a district where the rating valuation is low, it is sometimes necessary to reduce the number of lamps, and likewise the length of the lighting season, so as to economize and keep the lighting assessment reasonable. A reference to District No. 3, quoted above, will explain this—being a case in point.

In submitting their offer to supply and erect the lamps, also to supply gas, &c., my Directors had in view the desire to obtain the complete control of the lighting, and therefore included the automatic controller. The offer was simple and concise; being in the following terms:

> We have pleasure in offering to supply and erect the required number of lamps for your district, complete in every way with lamp column, 9 ft. high, set in concrete foundation, copper stormproof lantern, frog, burner, and mantle, and fitted with the Alder and Mackay pressure wave apparatus, for the sum of £4 12s. 6d. Should you desire these erected without the controller, our price would be £3 12s. 6d. each.

After a short practical demonstration of the controller, the Committees agreed to adopt them, and accepted our offer.

The lamps were placed on the edge of the footpath, set into a concrete base 21 in. square by 15 in. deep. A separate connection was made to the main in the majority of cases; while in every instance a ¾-in. service pipe was laid to the bottom of the column, with ½-in. pipe up to the lantern. In every instance nothing less than ¾-in. pipe is laid in the ground. I consider the extra cost of the pipe in doing this a good insurance premium against future trouble. With regard to the size of the up-pipes to the lantern, I am of opinion that nothing less than ½-in is required. The exposed position in which they are placed, their liability to become frozen or traps for naphthalene deposits, and the effect of condensation on the gas supply, are objections to any smaller size of pipe. The average number of lamps per mile of roadway lighted is 16. In placing the lamps in position care was taken to put them at convenient corners, bends, and all on the one side of the road as far as possible; so that as time goes on and surplus funds accumulate, more lamps can be erected on the opposite side, put midway between the existing lamps, without having to resort to re-arrangement.

Turning, now, to the lighting and maintenance of the lamps, the offer submitted to the respective Committees gave a range of season and hours from which they could adopt the most suitable according to the circumstances, and was in the following terms: We offer to supply gas, mantles, petty repairs, cleaning, painting, lighting and extinguishing, with the controller, and taking all re-responsibility for satisfactory lighting, for a season of eight months from Sept. 1 to April 30, from dusk to 11 o'clock, from dusk to 10.30 o'clock, and from dusk to 10 o'clock; for seven months from Sept. 15 to April 15 on the same hours; and for six months from Oct. 1 to March 31 on the same hours.

The Committees each adopted their own lighting season. No. 1 District adopted an eight months' season, extinguishing at 10.30 o'clock, for a period of 15 years, on a sliding-scale basis contract, so that, as the price of gas varied, they obtained a share of the benefit. No. 2 decided on a seven months' season, extinguishing at 10.30; while No. 3 decided on a six months' season, extinguishing at 10—both on a yearly contract with a view to gaining every advantage. No. 1 District is operated from the Largo works with a two-wave apparatus; while Nos. 2 and 3 are operated from the Kennoway works, being fitted with a three-wave apparatus to suit the different extinguishing hours. The price of gas for street lighting is that charged to our ordinary consumers, without discount or allowance, although we were met at first with requests for allowances varying from 10 to 33⅓ p.ct. reduction on the ordinary rate, in lieu of some very questionable privileges, all of which I may say we enjoy to the full.

The extent to which street lighting is put forward to gas companies as an object worthy of their charity is very prevalent; and I grant there are some cases where real concessions are given in return which may not be appreciated in terms of "£ *s. d.*" But there are other cases where such charity has been given simply because it is for street lighting, resulting in a heavy loss for the company concerned, and redounding very hard against neighbouring districts. Street lighting accounts should be able to stand on their own feet, so to speak.

My experience of automatic controllers convinces me of their many advantages in country district lighting. [These the President briefly pointed out.] Personally, I am of opinion it is much better for the gas manager to have complete control in every department where automatic lighting is in use, and so avoid the friction as to who is responsible where dual control is applied in lighting and maintenance.

The question of the relative costs of automatic against hand lighting is a subject of very great interest, but which I will not deal with, because there was no proper lighting previous to the introduction of the controllers. Therefore, I have no reliable data to work upon; while it is a subject requiring treatment by itself. But having kept a simple record of the working results and costs for a number of years, I propose to give some of these which may be of interest.

The following table shows the records for three years:

Year.	Days in Season.	Moonlight.	Lighted.	Hours Lit.		Total No. of Actuations.	Apparatus Failed.	Bye-Passes Failed.
				No. 2.	No. 3.			
1912-13	214	44	170	817	656	35,036	23	77
1913-14	212	42	170	789	644	35,916	68	99
1914-15	212	43	169	777	710	25,006	20	51

In the year 1912-13, the number of lamps employed was 74, and 360 mantles were used; in 1913-14, the numbers were 74 and 128 respectively; and in 1914-15, 76 and 39.

The number of moonlight nights in the season is worthy of note, being consistent; likewise the number of hours lighted. Newbigging's tables, adjusted for the respective lighting seasons and moonlight deduction, show the following hours: No. 2 District, 950 hours; No. 3 District, 833 hours. During mid-season 1913-14, inverted burners were fitted by the Gas Company at their own expense, because of the heavy charges in maintaining the upright mantles. The expense was recovered the following year by the saving effected on mantles alone; while a great improvement was effected in the illumination.

For the 1914-15 season, No. 3 District adopted the same extinguishing hours as No. 2, and the apparatus was altered to a two-wave operation; while the new cut-off bye-pass was fitted, also an improved form of bye-pass tip, each giving increased efficiency. I might add here that a record of the weather conditions is made each day on the report-sheet—such as "Stormy," "Wind," or "Mild," as the case may be—which affords an explanation of bye-passes out and mantles renewed.

The following is an abstract of the maintenance costs per lamp per season for the same three years as are referred to in the statistics:

Year.	1912-13.	1913-14.	1914-15.
Wages attending to lamps	2 3·7	2 6·0	2 5·3
Mantles, petty repairs	1 3·2	2 5 0	0 7·5
Storage of lamps during summer	0 3·3	0 3 25	0 3·25
Painting	1 3·0	1 3·0	1 3 0
	5 1·2	6 5·25	4 7·05

Petty repairs include mercury, nozzles, glass sides, and such like accessories.

In conclusion, I would mention that my Directors find the street lighting a profitable source of business, and paying its own way.

DISCUSSION.

Mr. William Geddes (Granton) said they all agreed with the remarks of Mr. Scott as to the necessity for reorganization of the gas industry, not only after the war, but now. There was no doubt that we were living in days of stress and strain, and that the stress and strain would be increased as time went on. New problems were being discussed, and were arising daily in the course of their work; and an effective way of dealing with them must be found. In regard to the author's methods of street lighting, he would like to ask if he found much difficulty during storms in maintaining his lighting. Were his lanterns quite effective against storms?

Mr. Scott replied that the lanterns were storm-proof. The only thing that gave them trouble in time of stormy weather was if the station governor started "creeping." The result of this was that the pressure rose in the district and greatly interfered with the light-loading apparatus.

Mr. J. R. Moyes (Edinburgh) remarked that what struck him most was the low cost of the maintenance in regard to mantles and petty repairs in 1914-15.

Mr. Scott explained that if reference were made to the statistics given it would be found that there were only 39 mantles used in repairs on 76 lamps, and that the cost of these mantles, divided out per lamp with the other petty repairs included, made the figure mentioned.

Mr. Thomas Kay (Fauldhouse) said that, so far as Fauldhouse was concerned, the "booster" had been a perfect godsend, and he could thoroughly recommend it to anyone who thought of trying it.

Mr. D. Campbell (Kinross) said it was a very important thing in connection with the "booster" that the steam should be near the "booster" in use, and that they should always be able to get a good hard steam. Even if they worked it with the greatest care possible, it took no action until the steam suited, then it went up with a jerk, and they had to check it every time. He thought it would be a great improvement in the steam "booster" if some better arrangement were made to complete the condensation in the pipes.

The President said that, where possible, the drier the steam the more effective it was. It was a well-known fact that wet steam for any purpose whatever was a very detrimental thing.

Report of the Council.

The report of the Council for the thirteenth session of the Association stated that the attendance of members at the various meetings and visits was an improvement as compared with the previous year. The Council felt satisfied that the results of the session just finished agreed with the policy of maintaining a full programme. During the session three members had resigned, two had lapsed, one had died, while eight new members had been added; making the roll of membership 12 honorary and 76 ordinary members—a decrease of one honorary member, and an increase of three ordinary members, compared with last year.

The following members were to be added to the Association's Roll of Honour: D. Morton, Grangemouth; J. Smart, Hawick; and J. Paterson, Cowdenbeath. The Council sincerely regretted the death of Mr. A. Morton Fyffe, of Blackburn, who was a Past-President and an honorary member of the Association.

During the session the following gentlemen had contributed to the Association's literature; and the Council took the opportunity of thanking them for the services rendered: H. Hartley, Warrington; R. S. Johnstone, Dundee; D. Campbell, Kinross; R. J. Gavin, Galashiels. The joint visit with the Western District proved a great success.

The Council desired to express the thanks of the Association to Mr. Kincaid, Kirkcaldy; Mr. Yuill, Dundee; Mr. Scott, Galashiels; Mr. M'Pherson, Cupar; and Mr. Wilson, Falkirk, for the privilege of visiting their works, and for the hospitality extended on the occasion of the visits.

The Amalgamation Question.

The President remarked that very slow progress had been made with the question of amalgamation with other Associations. He suggested that the matter be again left in the hands of the Council, to report on as they found convenient. The suggestion was agreed to.

Office-Bearers.

The President, after suitable tribute to the help he had received from his colleagues on the Executive and the members generally, indicated his desire to resign from the presidency, in order that the honour might go round.

Mr. Moyes referred to the splendid services Mr. Scott had rendered to the Association, and asked him, in view of present circumstances, if he could not see his way to reconsider his decision.

Mr. Geddes said he quite agreed they were asking a great deal of Mr. Scott when they wished him to take on the responsibility of the chair for another year—or, should he say, the duration of the war?—yet he felt that if it could be done it would be all to the good.

After further requests from other members, Mr. Scott agreed to continue in office.

Mr. L. Farquhar (now on service) was re-elected Vice-President; and Mr. R. Scott (Cowdenbeath), the Hon. Secretary and Treasurer, was also re-elected. Messrs. R. Waddell (Polmont), D. Campbell (Kinross), and Thomas Kay (Fauldhouse) were appointed to fill three vacancies on the Council.

Balance-Sheet.

According to the annual balance-sheet, the working of the Association during the year showed a deficit of £1 16s. 6d.

Programme for Next Session.

In regard to the programme for next session, it was agreed that they should have four meetings—a visit to Perth and one to Dunfermline, and two meetings in Edinburgh. It was left to the Council to fix up the visits, having regard to the particular circumstances prevailing at the time.

A Question Box.

The meeting also accepted a motion by Mr. Waddell, seconded by Mr. Moyes, that a "question box" should be established at future meetings of the Association, with a view to discussions among the members on subjects of general interest.

Votes of Thanks.

Before the proceedings terminated, the thanks of the Association were accorded to Mr. R. Scott, the Hon. Secretary and Treasurer, for his services during the session.

REGISTER OF PATENTS.

Discharging Coke from Vertical Retorts.

Wellington, S. N., of Mark Lane, E.C.

No. 13,253; Sept. 16, 1915.

This apparatus—for discharging and preventing the undue breaking-up of coke produced in vertical retorts and the like—has for its object to maintain the coke in as near as practicable the condition in which it leaves the retort, after being dry-quenched, and to convey it away in its unbroken condition for loading into trucks or barges, or to be otherwise disposed of. The invention is more especially applicable for use in connection with apparatus for dry quenching coke distilled at a low temperature, as described in patent No. 16,108 of 1915.

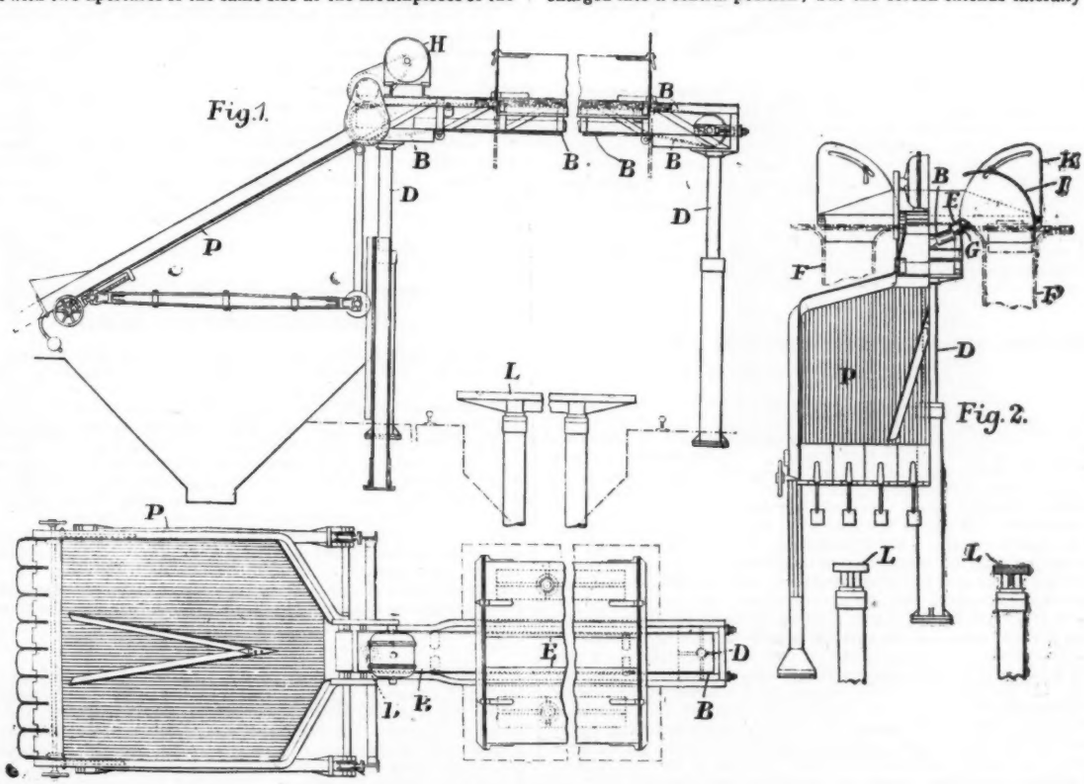
Fig. 1 represents a side elevation and plan of the apparatus; fig. 2, an end elevation partly in section.

The plant consists of a frame of a girder construction comprising longitudinal members forming between them a space within which the conveyor or belt B passes to and fro. It traverses the length of the frame, and an electro-motor H with reducing gear is mounted at one end, through which motion is imparted to the driving drum around which the belt passes; while at the opposite end of the frame a freely mounted drum, within bearings capable of adjustment, sets the belt to the proper tension.

The apparatus discharges from two receptacles F; and the frame is provided with two apertures of the same size as the mouthpieces of the receptacles, the edges of which are formed by the outwardly protruding edge of the plate E, by the lower end of the curved metal plate I, and the vertical supporting plates K. These latter plates (fixedly mounted on the frame) serve for the support of the plate I at each end in positions determined according to the width of the receptacles F. The plates at each end and on each side are provided with a curved slot for the reception of a screwed pin or fitting mount at each end of the plate I in a position near its upper edge and adapted to pass through the curved slot so that the inclination of the plate may be varied as required. On the upward movement of the charge of coke within the receptacles F it impinges against the plates I and, by contact with the curved plate, is made to fall inwardly a short distance on to the belt.

The ram D is adapted to move the receptacles F into position immediately beneath the carrying frame, which may be lowered so that the angle irons G rest upon the edges of the mouths of the receptacles, and the lower extremity of the plates I may also protrude into the mouths of the receptacles. Thus on the upward movement of the coke from within the receptacles it is discharged on to the conveyor as described. For this purpose the receptacles run on rails so as to be conveniently brought from the position in which they are charged to the discharging position. For this purpose rams L are provided between the rails adapted to have a vertical movement and to pass upwardly through the receptacles, carrying with them the bottom door of the retort upon which the coke lies on its discharge from the retort; so that the charge in the receptacles is thus forced completely through the lateral apertures formed in the carrying frame and conveyed away to the screen P.

The screen is of such shape that the coke from the belt B is discharged into a central position; but the screen extends laterally so as



Wellington's Coke Discharger from Vertical Retorts.

to afford ample area for the discharge of coke upon it. The lower end of the screen is substantially horizontal, and the struts supporting it are connected at one end to the lower end of the screen, while at the other end they are carried by vertical rods extending from the upper end of the screen frame. These rods serve to carry a horizontal rod at whose extremities the ends of the respective struts are carried; while grooved wheels are provided to run upon vertical guide-rails, so that as the carrying frame is moved the screen is also moved, supported on the guide-rails.

Recovering Ammonium Chloride as a Bye-Product in the Manufacture of Gas.—No. 104,942.

Myers, E., and the Shelton Iron, Steel, and Coal Company, Ltd., of Stoke-on-Trent.

No. 4798; March 31, 1916.

This invention has for its object to recover the ammonia free from colouring matter.

According to one method of carrying out the invention, the chloride solution obtained from the retorts is evaporated in a Kestner evaporator, so that the salt is left in crystal form, but dark in colour. This salt (dried and thus freed from water) is ground up with 2 p.ct. of its weight of nitro-hydrochloric acid; and the mixture is then dissolved up to make a solution which can be treated with the carbon. The solution is boiled in an open tank by means of live steam blown into it, which steam also carries air into the solution by an injector action. Fine particles of carbon are mixed with the solution, and, together with the air, effect the desired decolorizing. After boiling for about a quarter of an hour, ammonia is added to the solution to neutralize it; and the whole is then filtered and the solution once more evaporated until the requisite strength for crystallizing is obtained. The resulting salt, dried by centrifugal or other means, is free of the dark colour which it is the object of this invention to remove.

Apparatus for Igniting Gas.—No. 104,960.

Deplanque, A. J. O., of Paris.

No. 6733; May 11, 1916.

This ferro-cerium lighter or igniter for gas at burners, furnaces, stoves, and the like, is characterized by the arrangement and the combination of the following constituent parts: (*a*) An operating device comprising a rod for setting the apparatus, provided with a link or rod connected to a pawl acting on a circular rack or ratchet wheel serving to turn a disc or wheel with a milled or roughened edge rubbing against a piece of ferro-cerium—the rod being provided with an operating spring and with a retaining and releasing device comprising a spring and a press button. (*b*) An adjustable fixing device, permitting the igniter to be mounted readily on any gas fire or furnace.

Atmospheric Gas-Burners.—No. 104,976.

Parkinson Stove Company, Ltd., and Hickinbottom, F., of Stechford, Birmingham.

No. 7979; June 5, 1916.

These burners are of the type comprising a central secondary air-duct around, or on opposite sides of, which is a series of gas exit apertures formed between deep walls arranged parallel with one another in the direction of their depth—the walls being provided with ribs or grooves which form a series of deep separate gas-ways arranged uniformly around, or parallel with, the central air-duct, so that the gas is broken-up into a series of fine streams. Instead of the passages being arranged vertically as heretofore, they are inclined to the axis of the air-duct, "whereby the necessary length of the passages can be obtained with less vertical depth of the walls, while the construction and assembling of the burner is considerably simplified."

Purification of Benzol Still Effluents.—No. 104,999.

Sheard, J. T., of Birley Carr, near Sheffield.

No. 9636; July 8, 1916.

In connection with the rectification of crude benzol by steam distillation, and especially where a preliminary washing by means of acid and alkali is carried out, there is (the patentee points out) an objectionable waste effluent from the stills and settling tanks which it has hitherto been difficult to get rid of without causing a nuisance.

Ordinarily, the effluent as it comes from the still is neutral to litmus paper, or faintly alkaline; but occasionally it is slightly acid. In this case its acidity must be neutralized (and the emulsion rendered faintly alkaline) before, or at the time of, treatment with the aluminic solution to admit of the required reaction taking place. In carrying out his invention therefore in one form, with an effluent which is slightly alkaline, the patentee adds the predetermined quantity of a solution of alum to the effluent in a suitable mixing vessel, and agitates the whole together so as to bring the reagent into intimate admixture with the effluent. He then passes it into a settling tank suitable for separation of the precipitate by decantation, and allows time for the precipitate to settle down. The tank has a pipe arranged at a convenient height to draw off the clear water, and has a sloping bottom with suitable outlet for facilitating the collection and removal of the precipitate, which consists to a large extent of "valuable hydrocarbons," which may be recovered in any well known way.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 18.]

Nos. 4969—5310.

Brégeat, J. H.—"Process for recovery of ether, alcohol, benzene, or/and acetone from gaseous mixtures." No. 5089.

Copisarow, M.—"Process for production of carbazole from crude anthracene." No. 4972.

Daniel, A.—See Brégeat. No. 5089.

Euler, C. F.—"Gas-generators." No. 5272.

Halperin, A.—"Gaseous-mixture generator." No. 5105.

Hunt, W. H.—"Equalizing or maintaining an equilibrium or any predetermined condition of pressure in retorts or off-take pipes in the manufacture of coal gas or the volatilization of other suitable substances." No. 5037.

Macintosh, A. A.—See Hunt. No. 5037.

Mellor, F.—"Recovery of sulphate of ammonia from producer, &c., gases." No. 5096.

Morris, J. M.—"Gas burners." No. 5190.

Sahlin, A.—"Gas-producers." No. 5160.

Stewart, J.—"Gas-producers." No. 4982.

Tredegars, Ltd.—See Morris. No. 5190.

Verity, C. H.—"Gas-fire. No. 4977.

Applications to Avoid or Suspend Patents.

Application has been made for licences, under the Patents (Temporary Rules) Acts, 1914, by L. B. Holliday, in connection with the following series of patents relating to anthracene colouring matters, &c., granted to the persons named: Johnson (*Badische Anilin und Soda Fabrik*), 16,538 of 1904, 1818 of 1905, 14,578 of 1905, 17,242 of 1905, 22,519 of 1905, 10,324 of 1906, 20 837 of 1906, 4235 of 1907, 14,338 of 1908, 7931 of 1909, 24 486 of 1910, 894 of 1911, 21,710 of 1911. Badische Anilin und Soda Fabrik, 16,505 of 1907. Newton (*Farbenfabriken vormals F. Bayer & Co.*), 1822 of 1908, 2702 of 1909, 3055 of 1909, 12,619 of 1912. Imray (*Farbwerke vormals Meister, Lucius, und Bruning*), 25 551 of 1908. The date of hearing is next Thursday.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Economical Gas Making—An Investigation.

Sir,—May not the comparatively small number to which you refer of applications under the Gas (Standard of Calorific Power) Act, 1916, be attributed—in part at any rate—to a growing conviction, born perhaps of war time experience, that a standard of 500 B.Th.U. is not the last word on the subject?

At all events, it seems to emphasize the importance of your suggestion that the considered views of the industry should be laid before the Board of Fuel Research, with special reference to the most economical methods—and possibly applications—of gas production, and the most suitable standard of quality, having regard to the enormous development now proceeding in the use of our gas for fuel purposes, both industrial and domestic.

Sir Robert Hadfield has just told us that his firm is using annually about 500 million cubic feet of Sheffield gas; and I rather think that to a considerable extent this could be matched nearer home, while everybody knows that during the last year or so gas-fires have come into their own with a vengeance.

There are advances on the road to that general use of town gas for heating purposes to which we may look for a revival of prosperity after the war under suitable conditions, in which belief an investigation somewhat on the above lines has been initiated by the South Suburban Company, and is now proceeding. I need hardly add that we shall gladly welcome the co-operation of any who may be disposed to assist in a work which may prove to be of far-reaching importance.

17, *Victoria Street, S.W.*, *April* 21, 1917. Charles Hunt.

Macclesfield Gas-Works Results.

The comparative statements of the Engineer and Manager of the Macclesfield Corporation Gas-Works (Mr. J. E. Blundell), show that for the year ended March 31 there is a net profit of £3626, which is a decrease of £2498 when compared with the figure for the preceding twelve months (£6124). The quantity of coal gas made—all in the Glover-West vertical retorts—was 186,108,000 c.ft., as against 206,639,000 c.ft.; but the amount of carburetted water gas produced was 11,710,000 c.ft., compared with 3,916,000 c.ft. The coal carbonized in the past year was 13,030 tons; the make of gas per ton being 14,282 c.ft. The calorific value of the gas supplied was 511 B.Th.U. Coal cost 2s. 6 6½d. per ton more than in 1916; while the price received for tar was 7s. per ton less. The prices per 1000 c.ft. charged for gas are: Power, 2s. 5d.; trade, 2s. 6d.; lighting, &c., 2s. 9d. Of the net profit of £3626, a sum of £2626 is to go to the maintenance fund, and £1000 to the relief of the rates. A year ago, the rates benefited to the extent of £2750.

Gas Manager's Tribunal Case.—Mr. Thomas Macdougall, a working Gas Manager in the employment of the Banff Gas Company, was before the Army Tribunal. He had been previously granted conditional exemption. The Military Representative stated that Mr. Macdougall was 31 on Feb. 7, 1915, and therefore his case did not come up for review under the regulations. It was suggested that Mr. Macdougall should join the volunteers. He stated, however, that his time was fully occupied with his duties in the gas-works.

LEGAL INTELLIGENCE.

British Patents and Enemy Ownership.

Last Thursday, in the Divisional Court of the King's Bench, the Lord Chief Justice and Justices Ridley and Rowlatt, had before them the question of the avoidance or suspension of two German Koppers' patents relating to the recovery of bye-products from the carbonization of coal. The point was as to whether the jurisdiction of the Board of Trade under certain recent Acts of Parliament to inquire into and avoid or suspend patents was ousted by the mere statement of one of the parties that he was a British subject—the other two being admittedly German. The Solicitor-General said it was sought to prohibit the Board of Trade from proceeding with two applications by Messrs. Simon-Carvès, Ltd., of Manchester, to avoid or suspend certain letters patent dated 1904 and 1905 granted to the Koppers Company. The grounds upon which a rule *nisi* was obtained were: (1) That it was not shown that the person or persons entitled to benefit under the patents was a subject or were subjects of a State at war with His Majesty; and (2) upon the evidence it appeared that the benefit of the patents was not vested in such person or persons. The patents were granted to Heinrich Koppers, a German subject, who was a partner in the firm of Koppers Coke Oven and Bye-Products Company, C. Rudolph Altenhein, a German who was interned in this country, and Victor Derry, a British subject. An order was made under the Trading with the Enemy Act, appointing a Controller to the firm; and when Messrs. Simon-Carvès applied for the avoidance and suspension of the patents, the Committee appointed by the Board under the rules sat for the purpose of hearing the application. Mr. Terrell, K.C., on behalf of Victor Derry, contended that, though the patents were granted to the Koppers Company, they were the property of a partnership, and that Derry was one of the beneficiaries. The Committee appointed by the Board of Trade had no jurisdiction to proceed with the application. The alleged partnership agreement was not then produced; but when the proper time came, he would be able to prove the partnership. The beneficial interest in the patent belonged to the firm; and the Comptroller had proceeded on the wrong basis. He asked that the rule *nisi* should be made absolute. The Lord Chief Justice, however, held that the Committee had jurisdiction. He said he had come to the conclusion that Mr. Derry's application for a rule of prohibition was wrong, and that the Comptroller had acted quite correctly. The rule must be discharged, with costs. Justices Ridley and Rowlatt concurred.

What is Cannel Coal?

In the City of London Court, last Tuesday, before His Honour Judge Rentoul, K.C., Messrs. Cleeves and Co., coal merchants, sued Mr. F. Hawkyard, of the gas-works, Upwell, near Wisbech, for £27 0s. 8d. for Nottingham cannel coal supplied. Defendant said that the coal was not Nottingham cannel, but shale. He had it for gas making; but it was poor in quality, and the smell was so abominable that the consumers threatened to discontinue the use of the gas. Some of the coal caught fire through spontaneous combustion. Mr. Finch (plaintiffs' Solicitor) said that the same coal was supplied with satisfaction to the Gas Light and Coke Company and half-a-dozen other gas undertakings, all of whom had large contracts. The case was adjourned for defendant to get legal aid, and to raise a counterclaim for damages for alleged misrepresentation.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Opposition to Bills Withdrawn.

The Chairman of Committees informed the House last Tuesday that the opposition to the following Bills had been withdrawn: Haslemere and District Gas Bill, Kenilworth Gas Bill, and Lea Bridge District Gas Bill. The Bills were committed to the Unopposed Bills Committee.

In the case of the Hemel Hempsted Gas Bill, the Select Committee reported that they had not proceeded with the consideration of the Bill, no parties having appeared in opposition thereto. The Bill was committed to the Unopposed Bills Committee.

The Haslemere and District Gas Bill, the Hemel Hempsted Gas Bill, and the Lea Bridge District Gas Bill will come before the Standing Orders Committee to-day (Tuesday).

HOUSE OF COMMONS.

Gas Light and Coke Company's Bill.

The Bill of the Gaslight and Coke Company was on Thursday read the third time and passed.

Sheffield Gas Company's Bill.

The Rotherham Corporation have withdrawn their petition against the Bill of the Sheffield United Gas Light Company.

The Directors of the Hathersage and District Gas Company have increased the price of gas 3d. per 1000 c.ft.

YOUR GAS.

THINK what a fighting force it has proved to Britain and her glorious Allies.

NO doubt you are anticipating further great demands with the moving months, for cooking by gas is patriotic as well as popular.

THEREFORE arrange for your supplies of "MAIN" Cookers now.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W. 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

MISCELLANEOUS NEWS.

THE SULPHATE OF AMMONIA POSITION.

Withdrawal of the Equalization Scheme.

The following circular-letter, setting forth the present position with regard to sulphate of ammonia, has been sent out (over the signature of Mr. D. Milne Watson, the Chairman of the Sulphate of Ammonia Advisory Committee). It is dated the 16th inst.

Sir,—Referring to our printed letter of Feb. 12, and our subsequent letter enclosing a copy of the equalization scheme, we wish to put before you a short statement of the present position.

The delivered price of £16 per ton and the altered conditions of sale for sulphate of ammonia for agricultural purposes were announced to the Sulphate of Ammonia Advisory Committee on Feb. 10 as a decision of the War Cabinet.

In March, the authorities of the Food Production Department of the Board of Agriculture took over from the Ministry of Food the regulation of sales and distribution of sulphate of ammonia; and on March 10 they intimated to the Committee that, in their opinion, the method first proposed for meeting the delivery charges required reconsideration.

In the meantime, although a considerable number of the largest makers (most of whom would have been contributors rather than recipients of money) had signed the equalization scheme, only a meagre response to the invitation to become parties to the scheme was received from those makers for whose benefit the scheme was primarily intended.

The increase in home consumption this season has been enormous; and in view of the guarantee given to farmers by the Government in respect of prices for cereals and potatoes, it is anticipated that the agricultural demand for sulphate of ammonia next season will be far larger still. At the same time, the requirements of the Ministry of Munitions will, we understand, be very considerably greater in the near future than they have been hitherto; so that the Committee are of opinion that the total quantity of sulphate of ammonia available for export between now and the end of May, 1918, will not be sufficiently large to justify their asking makers to undertake the accounting and clerical work demanded by the equalization scheme.

In view of these facts, the Committee have decided to withdraw the equalization scheme, and are returning the forms to those makers who have already signed it.

In order to give effect to the decision of the War Cabinet, that farmers are to be able to purchase sulphate of ammonia at £16 per ton delivered, we have agreed with the Food Production Department to recommend to makers for this season an arrangement by which that Department guarantees that, in respect of deliveries made on or after Feb. 12, 1917, up to and including May 31, 1917, for home agricultural use at not exceeding £16 per ton to farmers, or £15 10s. per ton to merchants delivered at any station in sellers' bags, net cash basis, 24½ p.ct. ammonia, the Government will defray the whole cost of delivery. But makers will be called upon to credit the Government with 10s. per ton out of the price obtained from the buyers.

The Government will immediately create a Sulphate of Ammonia Fund, and will pay and collect moneys directly to and from makers in respect of delivery charges.

The effect of this arrangement will be to guarantee that makers will receive a known definite price—viz., £15 10s. for sale to farmers or £15 for sales to merchants, free on rails at maker's works, 24½ p.ct. basis, in single bags, net cash.

A formal announcement of the details of the above arrangement will shortly be made to you by the Food Production Department.

With regard to the arrangements to be made for the season, June 1, 1917, to May 31, 1918, the Committee are now conferring with the Food Production Department as to the best means of supplying the demand for sulphate of ammonia.

SUGGESTED AMENDMENT OF THE SALE OF GAS ACT.

The Watch Committee of the Newcastle-upon-Tyne City Council have had under consideration a resolution passed by their Weights and Measures Sub-Committee, recommending that the Board of Trade should be urged to take steps in the immediate future to bring about the introduction of legislation amending the Sale of Gas Act, 1859, in the following particulars:

(1) An amendment of section 19, substituting for the present unsatisfactory system, whereby the fees for examination, comparison, and testing of meters are ascertained by reference to the number of revolutions of the meter per cubic foot of gas delivered, a system whereby uniform fees dependent for their amount upon the number of lights' capacity of each meter is fixed.

(2) That the number of revolutions or complete repetitions of the action of any meter per cubic foot of gas delivered shall for the future be standardized according to the capacity (in number of lights) of the meter, and shall not as at present be left to the varying practice of the different manufacturers of meters.

(3) That it shall be obligatory upon gas undertakers to secure that all gas-meters in use in their areas of supply shall be re-tested and stamped not less than once in every five years.

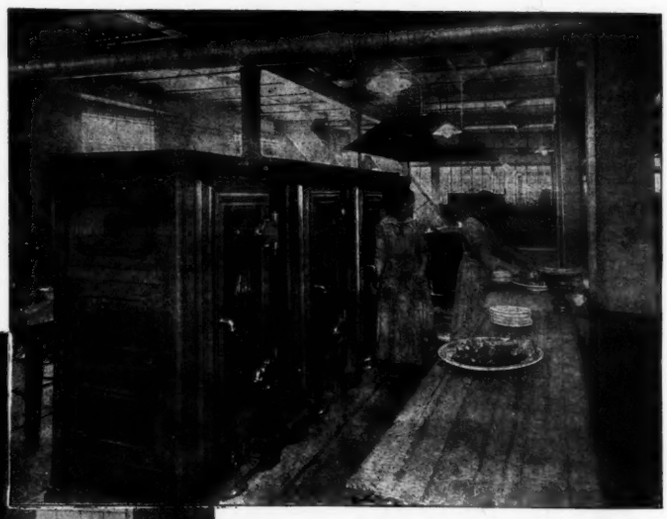
(4) That all gas-meters shall be tested both at low and at high pressure; and that if the limits of error prescribed by section 12 are exceeded either under the high or the low pressure, no such meters shall be stamped.

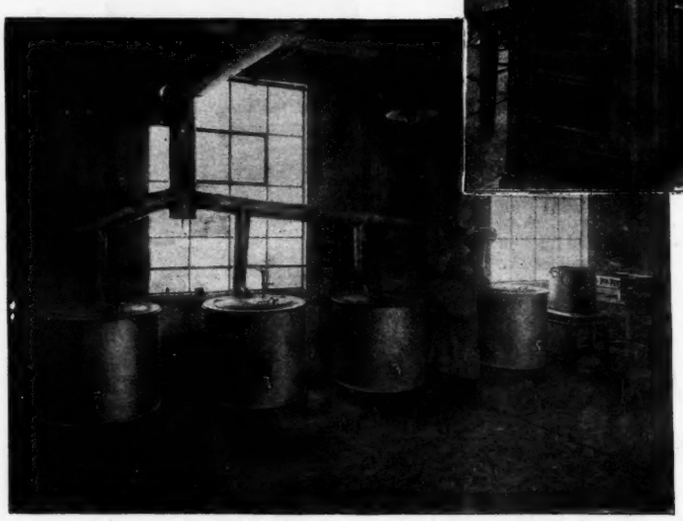
(5) That, with respect to all gas-meters fixed for the future, the indexes shall be tested and stamped before being fixed into the meters.

(6) That all gas-meters shall for the future be provided with uniform standardized inlets and outlets the size of which shall be dependent upon the capacity of the meter, instead of as at present it being permissible for the sizes of the inlets and outlets to vary with the differing practice for the time being adopted by the manufacturers of meters.

In forwarding the foregoing suggested amendments to the Board of Trade, Mr. A. M. Oliver, the Town Clerk of Newcastle, states that the opinion entertained by the Watch Committee is that, with the

ARDEN HILL'S
Gas-heated
COOKING, HEATING, & HOT-WATER APPARATUS





FOR CANTEENS, HOSPITALS, &c.

New fully illustrated List now ready. — Write to

ARDEN HILL & CO.,
Acme Works,
BIRMINGHAM.

present general increased cost of all staple commodities, it is a matter of increasing importance that amendments of the law on the foregoing lines should be brought about at an early date, and that gas undertakers should be placed on a similar basis to other vendors of commodities of daily necessity in being required to sell strictly according to prescribed and definitely ascertainable legal measure; and that, in arriving at these conclusions the Watch Committee "are particularly impressed by the consideration that, notwithstanding the greatly increased pressure at which gas is normally supplied, and notwithstanding the introduction of high-pressure systems of commercial lighting, no substantial amendment of the law with respect to the sale of gas has been made for upwards of half-a-century."

At the last monthly meeting of the Oldham Town Council, on the minutes of the Gas Committee being submitted for approval, a member asked whether anyone could explain the meaning of "a resolution [the foregoing] in the name of the Gas-Works Committee, which the Newcastle-upon-Tyne City Council had asked the Committee to support"? Mr. Ashton, the Deputy-Chairman of the Gas Committee, said the Gas-Works Committee had the matter under consideration at the present time, adding that a copy was being forwarded to each member, and that at a future meeting it would be further gone into.

As the result of inquiries (writes a Lancashire correspondent), it appears that for the period of the war the Newcastle resolution is not likely to be carried much further, as many of the local authorities who have been communicated with consider war-time inopportune to go into the question of amendments of the Sale of Gas Act. The Board of Trade have, it is understood, "filed" the letter from the Town Clerk of Newcastle.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *April* 14 *

There is no new feature in the position, exports still being prohibited, and the prices for Home agricultural purposes remaining at £15 10s. to mixers and distributors and at £16 per ton direct to farmers, net cash, in makers' bags, carriage paid to consumers' stations anywhere in the United Kingdom.

Nitrate of Soda.

There is no change in the spot market, which remains steady at 24s. per cwt. for ordinary quality, and 24s. 3d. per cwt. for refined.

* Owing to the disorganized condition of the postal service, this report did not reach us until after last week's issue of the "JOURNAL" had gone to press. The report is now given, however, in order to preserve the continuity of our weekly record of the market.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 23.

Pitch continues in demand; some buyers being anxious to secure quantities before the end of the shipping season. It is reported that 36s. per ton in bulk at makers' works has been paid for export for prompt shipment. Solvent naphtha remains unchanged at about 2s. 2d. per gallon, net and naked. Creosote is in good demand for various purposes, and makers' price is 4½d. per gallon, in bulk, at works.

Orders are still being placed for sulphate of ammonia for agricultural purposes, even for delivery into May.

Tar Products in the Provinces.

April 23.

Markets for tar products remain the same, and prices are unaltered.

The average values for gas-works products during the week were: Gas-works coal tar, 20s. 3d. to 24s. 3d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s., Liverpool 16s. 6d. to 17s., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3¾d. Heavy oils, in bulk, North, 3¾d. to 4d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *April* 21.

The situation remains unaltered. Exports are prohibited, and the prices for home agricultural purposes are fixed at £16 per ton direct to farmers, and at £15 10s. to mixers and distributors, net cash, in makers' bags, carriage paid to consumers' stations in Great Britain and Ireland.

Nitrate of Soda.

This market has advanced further, and to-day's quotations on spot are 24s. 3d. per cwt. for ordinary quality, and 24s. 6d. for refined.

Gas Light and Coke Company's War Bonus.—The Gas Light and Coke Company have granted an additional war bonus of 5s. per week to their male employees, and 2s. 6d. to the women workers. This makes a total war bonus of 15s. for the men, and 8s. 6d. for the women.

WE SUPPLY
"CRUDE BENZOL PLANTS"
FOR WORKS CARBONISING
"30 TONS OF COAL"
PER DAY, AND UPWARDS.
R. & J. DEMPSTER, Ltd.,
MANCHESTER.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is a little more active, as the home demand is good; and arrivals of steamers being more regular, the foreign demand is a little better met, though some of the collieries are still working short time. In the steam coal trade, best kinds are in good demand generally. Best Northumbrian steams are steady at 30s. per ton f.o.b.; for second-class steams, the current price varies from about 21s. to 22s.; and steam smalls are from 16s. to 19s. 6d., the latter class being in full supply. In the gas coal trade, the consumption has been very heavy, and the stocks need replenishing; so that the demand is full for the time of year. Best Durham gas coals are 25s. 6d. to 26s. per ton f.o.b.; for second-class gas coal, the price quoted is from 17s. to 19s.; while "Wear specials" are from 16s. 9d. to 18s. Production is fairly good; but high freights are asked for prompt steamers—20s. to 20s. 6d. being quoted for gas coal rates, Tyne to London. There are more forward inquiries for coal; but contracts are slower than usual in being settled—the scarcity of steamers being one of the chief causes. The further enlisting of miners must be expected to check the slight increase that has been known this year in the coal output of Durham, and it will make the increase of the stocks slower than usual in the summer. Good gas coke is quoted from 30s. 6d. to 32s. per ton f.o.b. Tyne. The freight of coke is high; the rate this week being 46s., Tyne to Rouen. Even at this high rate, steamers are scarce.

Primitiva Gas Company of Buenos Ayres, Ltd.—The accounts which will be submitted at the sixteenth annual meeting next Tuesday show a loss on the working for the year ended Dec. 31 of £25,391. The Directors in their report state that the cost of coals and freight has, owing to the war, steadily increased; coals delivered into the works in Buenos Ayres having cost in 1916 £3 4s. 5d. per ton, against £2 2s. per ton in 1915, and £1 14s. in 1913. The financial depression in Buenos Ayres has become more accentuated, causing a further serious falling off in the sales of gas and residuals, with a resulting decrease of £77,021 in the gross revenue. In spite of every effort to obtain from the Buenos Ayres Municipality permission to advance the selling price of gas, they still refuse to meet the Company in any way, although they know that almost every other municipal authority in the world have permitted substantial increases; neither have they paid for the public lighting since the war broke out. Capital expenditure having been reduced to a minimum, the network of mains was only increased by 1 mile, making a total of 1137 miles; and there were connected with the system only 422 additional services, the total number of services being 205,868. The works have been maintained in full and efficient repair out of revenue; but again it has not been possible to make any provision whatever in the accounts for the Retiro works amortization.

Southport Gas Engineer's Salary.

At a meeting of the Southport Town Council last Tuesday, Mr. Snow referred to a resolution of the Gas Committee that, "in view of the fact that the Gas Engineer had relinquished the house at Crowlands [the gas-works], which he had rent free as part of his salary, he be paid the sum of £25 per annum in lieu thereof." Moving that the resolution go back to the Committee, he said eighteen months ago Mr. John Bond (the Engineer) asked permission of the Council to reside elsewhere; and when the request was brought before the Council, it was distinctly said by the Chairman of the Committee that Mr. Bond was willing to pay the rent of his new house. Mr. Rhodes, in seconding, said the rates of the house were paid by the Corporation, Mr. Bond had a telephone, he had had each room fitted up for gas, and he had had an unregistered supply of gas, which went towards the "unaccounted-for" gas. He realized that Mr. Bond had suffered owing to the extra taxation, and also in regard to pupils. He had done good service to the Government; but whether he was getting any remuneration for this, he did not know. His reason for speaking was to assert that this was an improper method of paying salaries. Alderman Trounson replied that Mr. Bond got no remuneration from the Government, except when he travelled so many miles. If he did not travel thus far, he had to pay his own out-of-pocket expenses. This was one of the gratuitous services which he rendered to the Government. The Committee were now getting £20 rental for the upper rooms of the house Mr. Bond had left; and they themselves were utilizing the lower rooms. They considered Mr. Bond was entitled to £25, seeing that the Committee were making this amount, at least, out of the premises. They felt the rental of the house really belonged to Mr. Bond. Mr. Duckworth declared that in Mr. Bond they had an official who was earning every penny they paid him. He was saving Southport thousands a year. The amendment to refer the minute back to the Committee was carried by 23 votes to 19.

Improved Consumption at Heywood.—It was reported at the last meeting of the Heywood Town Council that, with improved conditions in the local cotton mills, the consumption of gas for February showed an appreciable increase. The total for the quarter ended Dec. 31, 1916, was, however, 2¼ million c.ft. less than for the corresponding period of 1915. The high price of cotton has militated against activity in Lancashire mills; and many gas departments in the area are showing reduced figures as compared with 1915.

Imperial Continental Gas Association.—In their notice convening the one-hundred-and-sixty-ninth ordinary general meeting of the Association for next Tuesday the Directors express their regret that, owing to the continued absence of returns from their stations abroad, it will not be possible to submit any report or accounts. The members of the Board who go out of office by rotation are Sir Henry Birchenough, K.C.M.G., Mr. Hugh Goodwin Newton, and Col. H. Le Roy-Lewis, C.B., D.S.O.; and the Auditor retiring is Mr. C. F. Dendy Marshall, M.A. All are eligible for re-election, and offer themselves accordingly.

BRASS WORK

WE HAVE A GOOD STOCK OF TAPS, &c.

Send us your enquiries.

SAWER AND PURVES

(Branch of Meters, Ltd.)

MANCHESTER. NOTTINGHAM.

Advance for Maryport Gas-Workers.

Mr. H. H. Stoker, K.C., who has acted as Arbitrator in a wages dispute between their gas-workers and the Maryport Urban District Council, has accorded the labourers, in lieu of their present bonus of 4s. 6d. per week, an advance in wages of 7s. from the first full pay after March 17, and 25s. each in lieu of giving retrospective effect to the award. To the stokers, who were receiving a war bonus of 2s. per week, and asked for an advance of wages of 5s. a week, he grants an increase of wages of 7s. a week, together with a make bonus of 1½d. per 1000 c.ft. over and above 28,000 c.ft. Their make bonus was previously 1½d. per 1000 c.ft. over and above 22,000 c.ft. The Arbitrator concludes: "The advances in wages hereby awarded are to be regarded as war wages, and recognized as due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war."

Batley Gas-Works Accounts.

Addressing the Batley Town Council, Mr. Turner, referring to the local budget, said the past year was the first for a long time in which they had received nothing in relief of the rates from the municipal trading undertakings. The gas-works for many years had handed over sums varying from £2000 to £7000; the average for the past ten years having been £4600. In consequence of the increased cost of coal, &c., and higher wages, they had made no profit for two years; and whatever was realized in the coming years would have to be utilized in renewals and repairs to bring the plant to something like up-to-date condition. Some of this want of success might be partly attributable to the works not being up to present-day standard. Mr. Ramsden said they had £407,331 invested in the gas, water, and electricity works, leaving out what was paid off by sinking fund in past years, and were turning over £70,243 year by year on revenue account. The policy of the Corporation had been wrong. It had been one of extraction. They had taken money from the gas-works to make up the deficiency in the rates, until the works had become practically a skeleton. The policy was the same in other departments. The Mayor said those responsible ought to have made certain, when the money was in hand, that the works were kept in good condition, and not have allowed them to go to rack and ruin as they had done.

Glasgow Corporation Gas Distribution Department.

Through the courtesy of the Glasgow Corporation Gas Committee, the students attending the plumbing classes at the Royal Technical College during the past session visited the Milan Street workshops last Saturday week, for the purpose of inspecting the gas-furnaces there. The party were met by Mr. Ralph Halkett (the Commercial Superintendent of the Department); and, prior to viewing the furnaces, a short paper was presented by Mr. J. M'Isaac (the Department Gas-Furnace Expert), entitled "Gas-Furnaces: Their Recommendation, Fixing, and Adjustment." The paper was listened to with great interest, and was followed by a short discussion. In the furnace-room, the various apparatus was explained; and the action of the different classes of furnaces—for rivet heating, shell nosing, brass melting, and hardening of high-speed tools—was demonstrated. After tea, the results of the examination on the season's work were announced; and it was seen from the results that, though the calls made in the service of king and country had been heavy, the remaining students had given an excellent account of themselves. On the motion of Mr. P. Watson (Past-President of the Master Plumbers' Association), a vote of thanks was accorded to the Gas Committee for the interesting and instructive afternoon. Among those present were Bailie Drummond (Chairman of the Gas Committee) and Mr. Alexander Wilson (Engineer and General Manager of the Gas Department).

Low-Temperature Carbonization Plant for Nottingham.—The announcement is made that a site of about 400 acres near Nottingham has been acquired by an influential Syndicate, who intend to establish a low-temperature coal carbonization works, engineering and chemical works, and electric power plant. It is hoped to be able to sell electric current at ½d. per unit.

Lancashire Amalgamation Proposal.—At the last meeting of the Heywood Town Council, Alderman David Healey, J.P. (the Chairman of the Gas Committee), alluding to the linking-up scheme of Lancashire electricity undertakings, said he should be inclined to welcome a similar scheme in regard to gas and water supplies. In the past, there had been too much prejudice between local undertakings; and if amalgamation were adopted, it would mean a great saving to the people who used the supplies. Alderman Jackson, who also spoke on the subject, said that in the Potteries five towns had amalgamated. Why should not Heywood, Bury, and Rochdale do so? As Heywood was the central town of the three, it might be made the headquarters of the "combine."

Accidental Deaths from Gas Poisoning.—A table compiled from official statistics shows that the accidental deaths from illuminating gas poisoning per 100,000 of population in 1912, numbered 4·67 in Philadelphia and 6·16 in New York City. In 1916, the figures were 5·09 for Philadelphia and again 6·16 for New York City. The "American Gas Institute News" says that a study of these figures will show there has been no connection in the past five years between the number of accidental deaths from illuminating gas poisoning and any supposed change in the methods of manufacture. For the past five years, New York City has averaged 1¼ more deaths per year in every 100,000 of population than Philadelphia. Such a small number of additional accidental deaths is surprisingly gratifying, in view of the congested conditions in New York City, and the cosmopolitan character of the population. The campaign of education in the correct use of gas, which is universally carried on by the industry, has had a splendid effect in decreasing the number of accidental deaths. There have been in the past five years great increases in the number of gas users, and a more extended use of gas for heating; but in spite of this, the percentage of accidental deaths has shown practically no increase.

THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.

ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD.,

Exeter, London, Manchester, Leicester.

Telegrams: "WILLEY, EXETER." "GASVILLADO, KINLAND, LONDON." "METERS, LEICESTER." "WILMETER, MANCHESTER."

Telephone Nos.: 132 EXETER. 224 DALSTON, LONDON. 4777 LEICESTER. 7419 CITY (MANCHESTER).

LONDON WORKS & OFFICES:
89-95, Hertford Road, Kingsland, N.
LEICESTER:
5, Oxendon Street.
MANCHESTER:
John Street, Booth Street West, S.W.

AGENTS FOR SCOTLAND:
D. M. NELSON & CO., 20, WEST CAMPBELL ST., GLASGOW

Skegness Gas Purchase.—Figures presented at a meeting of the Skegness Urban District Council last Tuesday indicate that the legal and other costs incidental to the recent acquisition by the ratepayers of the undertaking of the local Gas Company are likely to make a serious hole in prospective profits. It was reported that the cost for purchasing had been very heavy, involving an outlay of £17,000 of a £23,000 undertaking.

Controlling Output of High-Boiling Tar Acids.—An order has been issued requiring the occupiers of factories and workshops specified in a schedule attached to the order, to place at the disposal of the Army Council the whole output of: (1) The high-boiling tar acids capable of being produced at the factories from such blast-furnace creosote oil as may be supplied to them by, or on behalf of, the Director of Army Contracts between April 16 and July 15, 1917; and (2) such spent oil as may remain over from the manufacture of such high-boiling tar acids, and to deliver such high-boiling tar acids and spent oil in such manner as may be directed by, or on behalf of, the Director, and to furnish to the Director such information as to the cost of, and profit on, the production of the high-boiling tar acids as he may cause to be required, and to verify the information in such manner as he may direct. Among the firms included in the schedule are Messrs. Newton, Chambers, & Co., of Thorncliffe, near Sheffield.

In consequence of the shortage of petrol, motor-omnibuses in South Durham are now being driven by gas, which is stored on top of the vehicles, in the manner that has already been explained in the "JOURNAL."

In a Sunderland house last Sunday week, a man and women were found dead from coal-gas poisoning. The cracks in the door and windows had been stuffed with paper, and a gas-pipe was cut. The couple were in very poor circumstances; there being no food in the house.

In presenting the financial statement to the Morecambe Town Council, Alderman Snowden said the Gas Department had overspent by £77. The total amount on all departments which was underspent was £3000; but this might be reduced by a possible loss on the Gas Department, the figures of which were not yet available. A loss of about £1000 was anticipated.

Ethel Edwards, who was employed at a Rotherham pawnbroker's, died a few days ago as the result of shock and burns through her dress becoming ignited by a gas-fire, in front of which she was standing. The stove was placed in a recess in the counter; but it was stated at the inquest to have been protected by a guard. As a matter of fact, it had been procured to replace one which was considered unsafe.

STOCK MARKET REPORT.

THINGS on the Stock Exchange went pleasantly indeed last week. Abounding cheerfulness prevailed in every quarter, actuated by many factors of varying potency, but all uniformly of good import. The brilliant military successes, the smooth course of financial operations, and developments in Washington were of prime importance among these.

Conspicuous beyond all the rest was the gilt-edged market, where Government issues throughout the Empire—Home, Colonial, Indian—were in hot demand. The War Loan led the way, rising steadily day by day. Home Rail prior charges were strong; but the ordinaries were neglected. Americans improved, and South Africans were firm. The Foreign Market was attractive; the French loan rising steadily in favour, while Russian, Japanese, and Chinese continued to improve. There was much animation in Miscellaneous; Rubber concerns were active and buoyant; and Oil advanced materially. Textiles and Bank shares were also among the favoured.

Business in the Gas Market was more active and quite interesting; recorded prices indicating a general accession of strength. It is true that one or two nominal quotations which had been left standing too long underwent revision; but the more general and prevalent movement was upwards. Gas Light issues made a further advance, and South Metropolitans gained a point. Imperial Continental had an exciting week, changing hands at a difference of twenty points. The exact situation is not quite clear; but more confident hopes are entertained in regard to the conservation of the Company's property now in the enemies' hands for the benefit of the proprietors. In the Money Market the tendency was variable, but at no time tight.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 70½, 71, 71¼, 71½, ditto preference 71, Imperial Continental 72, 72½, 74, South Metropolitan 76½. On Tuesday, Commercial 4 p.ct. 73, ditto 3½ p.ct. 66½, European 10¾, 10⅝, Gas Light ordinary 71, 71¼, 71½, 71⅝, 72, ditto maximum 56¼, ditto preference 71¼, 71½, Imperial Continental 75, 77, ditto debenture 60, 60⅜, 61, Newcastle 71¼, 71½, Primitiva 38s. 9d., ditto preference 58s. 9d. On Wednesday, Brentford "A" 83, Commercial 3½ p.ct. 65½, ditto debenture 53⅜, Gas Light ordinary 71⅜, 72, ditto preference 71¼, ditto debenture 55⅛, Imperial Continental 77, 80, 81, ditto debenture 62, Malta preference 4 11/16, Metropolitan of Melbourne 93⅜, Primitiva preference 57s. 6d. On Thursday, Gas Light Ordinary 71, 71½, 72¼, ditto maximum 57, ditto preference 71⅜, ditto debenture 56, Imperial Continental 83, 83¼, 89½, 90, 90⅜, 91, 91½, ditto debenture 65, Primitiva 38s. 9d., ditto preference 58s. 9d., 60s., Liverpool 82½. On Friday, Brentford "A" 83, 83½, Brighton and Hove "A" 104, Gas Light ordinary 71⅛, 72½, ditto maximum 56⅜, ditto debenture 55⅛, Imperial Continental 90, 92, Primitiva 38s. 9d., South Metropolitan 76, 76½, 76⅝, 76¾, 77. On Saturday, Gas Light ordinary 72¼, 72½, ditto debenture 55⅜, 56, Imperial Continental 90⅜, 91½, 92, 92½, 93, Primitiva 37s. 6d., ditto preference 57s. 6d., South Metropolitan 77, Tottenham "B" 70, 70½.

The Bank rate is 5 p.ct., as fixed on the 5th inst.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When last Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	58—63	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	60—62*	..
374,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞—6⅞	4⅜—5⅛	..
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water: 10 p.c.	24—30	24—26	..
883,110	10	,,	7	7/-	Bournemouth Gas and Water: B 7 p.c.	15—15½	10⅜—11¼	..
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	9¼—9⅜	..
159,740	—	—	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	..	71—73	..
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid.	261—266	83—85	83—83½
734,920	,,	,,	11	53/9	Do. B New	204—209	80—83	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	83—88	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	67—69	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	150—155	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	102—107	104
530,000	20	Mar. 26	12½	22/6	British	44—45	32½—33½	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245,771	,,	,,	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	57—60	..
100,000	10	,,	—	—	Cape Town & Dis., Ltd.	1⅝—2⅛	1¼—1⅞	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79½—80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	73
560,000	,,	,,	5⅞	46/8	Do. 3½ p.c. do.	103—105	65—68	65½—66½
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	53¼
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	37—39	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	58—60	..
278,400	,,	,,	—	11½%	Croydon B and C 7 p.c.,	..	170—180	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17½—18	10½—11½	10⅞—10⅞
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas and Coke: 4 p.c. Ord.	98—102	71—73	70⅝—72½
2,600,000	,,	,,	3½	3½%	Gas and Coke: 3½ p.c. max.	76—79	55—57	56½—57
4,062,235	,,	,,	4	4%	Gas and Coke: 4 p.c. Con. Pref.	96—99	71—73	71—71½
4,674,850	,,	June 11	3	3%	Gas and Coke: 3 p.c. Con. Deb.	72½—74½	55—57	55½—56
130,000	,,	,,	10	10%	Gas and Coke: 10 p.c. Bonds	..	..	..
2'8,740	,,	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	76—81	..
70 000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	8—9	..
26,600	—	—	—	9½%	Hornsey 7 p.c..	..	120—130	..
131,000	Stk.	Mar. 12	7⅛	7⅛%	Ilford A and C.	151—154	102—107	..
65,780	,,	,,	6⅜	5⅞%	Do. B	115—118	80—85	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	94—94	71—74	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	90—95	72—93
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	62—65	60—65
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	85—90	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—213	82—84	82½
					Liverpool 5 p.c. Ord. B	146—148		
306,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅝	3⅞—4⅛	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	88—93*	93⅜
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11⅜—12	8—8½	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98⅛—99½	71⅛—72½	71⅛—71½
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7/0	North Middlesex 7 p.c..	14—15	10—11	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	106—108	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅛—7⅜	2—3	..
60,000	50	Feb. 26	13	12½%	Portsea, Island B	128—131	92—97	..
100,000	50	,,	12	11%	Do. C	118—121	85—90	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅜—6	1⅞—2⅛	87/6—3s/9/
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅜—5	55/-—65/-	57/6—60/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo: 6 p.c. Pref.	10⅛—11	7⅞—8⅛	..
125,000	50	July 1	5	5%	San Paulo: 5 p.c. Deb.	47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	160—170	..
209,984	,,	,,	10	10%	Do. B	223—224	160—170	..
523 500	,,	,,	10	10%	Do. C	220—222	160—170	..
90,000	10	May 28	9	6/-	South African.	10⅜—11⅛	..	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	76—78	76—77
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72⅛—74½	55—57	..
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	140—142	..
952,795	,,	,,	6	4⅞%	S'th Suburb'n Ord. 5 p.c.	114—116	76—78	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	77—79	..
135,000	—	—	—	4⅞%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	77—79	..
120.000	,,	Feb. 12	7½	7½%	Tottenham: A 5 p.c.	135—138	95—100	..
782,275	,,	,,	6	5⅞%	Tottenham: B 3½ p.c.	115—117	68—73	70—70½
181.255	,,	June 26	4	4%	Tottenham: District 4 p.c Deb.	87—89	65—67	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	108½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	80/-	Wandsworth A 5 p.c..	151—156	114—119	..
255 636	,,	,,	6⅝	65/-	Do. B 3½ p.c.	129—134	99—101	..
108 075	,,	,,	5/17/8	56/-	Do. C 3½ p.c.	110—115	86—91	..
352,000	,,	,,	6⅛	58.9	Wimbledon 5 p.c.	117—122	88—93	..
98,000	,,	,,	6⅜	65/-	Epsom 5 p.c.	121—126	96—101	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	51—54	..

* Ex. div.